

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT				1. CONTRACT ID CODE <div style="text-align: center;">J</div>		PAGE OF PAGES <div style="text-align: center;">1</div>	
2. AMENDMENT/MODIFICATION NO. <div style="text-align: center;">0001</div>		3. EFFECTIVE DATE <div style="text-align: center;">24-Aug-2006</div>		4. REQUISITION/PURCHASE REQ. NO.		5. PROJECT NO.(If applicable)	
6. ISSUED BY AFGHANISTAN ENGINEER DISTRICT US ARMY CORPS OF ENGINEERS KABUL APO AE 09356		CODE W917PM		7. ADMINISTERED BY (If other than item 6) <div style="text-align: center; font-weight: bold;">See Item 6</div>			
8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)				X		9A. AMENDMENT OF SOLICITATION NO. W917PM-06-R-0059	
				X		9B. DATED (SEE ITEM 11) 09-Aug-2006	
						10A. MOD. OF CONTRACT/ORDER NO.	
						10B. DATED (SEE ITEM 13)	
CODE		FACILITY CODE					
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS							
<input checked="" type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer <input type="checkbox"/> is extended, <input checked="" type="checkbox"/> is not extended. Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning <u>1</u> copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.							
12. ACCOUNTING AND APPROPRIATION DATA (If required)							
13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.							
A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.							
B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).							
C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:							
D. OTHER (Specify type of modification and authority)							
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input type="checkbox"/> is required to sign this document and return _____ copies to the issuing office.							
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.) UNIFORMED POLICE PROVINCIAL HEADQUARTERS, CHEGHCHHRAN, GHOWR PROVINCE; QALA-I-NAW, BADGHIS PROVINCE, AFGHANISTAN. THE PURPOSE OF THIS AMENDMENT IS AS FOLLOWS: SEE CONTINUATION PAGES							
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.							
15A. NAME AND TITLE OF SIGNER (Type or print)				16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)			
				TEL: _____ EMAIL: _____			
15B. CONTRACTOR/OFFEROR _____ (Signature of person authorized to sign)		15C. DATE SIGNED		16B. UNITED STATES OF AMERICA BY _____ (Signature of Contracting Officer)		16C. DATE SIGNED 23-Aug-2006	

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

The following have been added by full text:

CONTINUATION**SUMMARY OF CHANGES MADE TO THE PROPOSAL:**

1. Section 00110, Para. 1.1.1 – “The list of projects **should** include the following information,” vice “The list of projects **shall** include the following information.”

2. Section 00110, Para. 1.2.1 – Delete paragraph in its entirety and replace with the following:

Volume I shall be typed, with numbered pages and sections tabbed. A cover sheet **should** identify the offeror and the project and the second sheet **should** be a table of contents. The Volume I proposal is limited to no more than 50 single-sided or 25 double-sided pages, printed on 8-1/2" x 11" sheets, not including the cover sheet and table of contents. Do not use condensed print. Do not submit any extraneous materials with your proposal.

3. Section 00120, Para. 1.B.2 – Delete sentence: “**The non-pricing (Volume I, Management/Technical) have equal weight to the pricing factor (Volume II) in the evaluation and selection process.**”

4. Section 00120, Para. 1.1.4 – Two occurrences of the same sentence. Delete the first: “**The contractor must discuss their intent or plan to utilize local labor and subcontractors when replying to evaluation factors.**”

5. Section 01010, Para. 2.12.4, Clinic – Add the following sentence to the end of this paragraph:

Provide split-pack air conditioning in all rooms.

6. Section 01010, Para. 2.11.1.2.k, CID Commo Room – Add the following to the end of this paragraph:

Split pack air conditioning, in addition to ceiling fans, shall be provided for the Communications Room. The air conditioning unit shall be sized to accommodate 4 personnel with 4 computers and 6 radios.

Note: Amendment also corrects incorrect paragraph numbering in this section. Was 2.11.1.2.g in RFP as advertised.

7. Section 01010, Para. 2.12.7.k, CID Commo Room – Add the following to the end of this paragraph:

Split pack air conditioning, in addition to ceiling fans, shall be provided for the Communications Room. The air conditioning unit shall be sized to accommodate 4 personnel with 4 computers and 6 radios.

Note: Amendment also corrects incorrect paragraph numbering in this section. Was 2.12.7.g in RFP as advertised.

8. Section 01010, Para. 2.7, delete in its entirety and replace with the following:

The contractor shall connect to local power if available and provide a backup power system as described below. An automated switching system shall be provided to activate the backup system in the event of local power failure. If local power is not available the power system described as follows will serve as the prime power plant for the installation.

POWER SYSTEM: The contractor shall design and construct a power system for supply and distribution to all buildings to include generators with fuel storage, and underground electrical distribution. All electrical design and installation shall meet NEC (NFPA 70) requirements. Electrical receptacles shall be provided as indicated in section 01015, Technical Requirements. Conductors and circuits shall be sized for the specific loads. The power plant shall include prime power generators, switchgear, and all appurtenances necessary to meet the electrical demand.

A minimum of two generators shall be sized to provide power for 120% of the maximum calculated demand load. Generators shall be provided with a synchronizer-switch, so that when total power demanded from one generator reaches 90% of the generators maximum, the second generator shall automatically start and supplement the first, sharing the load between the two generators equally.

GENERATOR FUEL STORAGE: The Contractor shall provide low-profile fuel storage tanks that can accommodate a 30 day fuel supply based on the generators operating at 100% load. As part of this contract, the Contractor shall provide a full supply of fuel to the tanks at the time of turnover to the Government. The Contractor will provide capability for fuel delivery from two locations – one from outside the wall surrounding the compound and one directly into the fuel tanks. The delivery point outside the compound wall shall be lockable and securable from tampering or sabotage.

Contractor shall design and construct all interior electrical systems as described in section 01015 Technical Requirements and shall design and install any required exterior lighting, as described in section 01015.

The generator pad for the Qala-i-Naw project site shall be combined with the refueling point described below and shall be located as indicated on the Conceptual Site Layout provided at Appendix A. Note that fuel delivery from outside the wall will not be possible at this site and this shall not be a requirement for this location.

9. Section 01010, Para. 2.10, delete in its entirety and replace with the following:

The Contractor shall design, in a location convenient for easy removal, a trash collection point. It shall be located outside the compound walls. The trash point shall be a 1.8 m X 1.8 m concrete pad with a 1.8 meter tall wooden fence about the perimeter. One side shall have a 1.2 m wide gate entrance.

10. Section 01010, Para. 2.11.3, delete in its entirety and replace with the following:

The Contractor shall design and construct a **low profile vehicle re-fueling point**, as specified in Section 01015, capable of storing 19,375 liters (5,000 gallons) of diesel and **11,356 liters (3,000 gallons)** of MOGAS.

11. Section 01010, Para. 2.12.5, delete in its entirety and replace with the following:

The Contractor shall design and construct a **low profile vehicle re-fueling point**, as specified in Section 01015, capable of storing 19,375 liters (5,000 gallons) of diesel and **11,356 liters (3,000 gallons)** of MOGAS.

12. Section 01010, Para. 2.11.1.1.h, and 2.12.2.h – Correct the following typo:

security door and hardward to **security door and hardware**.

13. Sec 01010, Para. 2.12.8. Delete sentence: The Provincial Commander shall be provided with a bedroom and shower/toilet room next to his office in the Administration Building.

Note: The requirement is repeated in para. 2.12.2 but the reference in para. 2.12.8 is associated with an option item. There should be no confusion that this requirement is part of the base bid.

14. Sec. 01010, Para. 2.12.8 (5), Modify the text to read:

Each barracks for Ordinary rank staff shall have a dedicated storage area sized to 0.5 SM per person assigned to the barracks.

SECTION 01015 TECHNICAL REQUIREMENTS. Delete this section in its entirety and substitute the attached SECTION 01015 TECHNICAL REQUIREMENTS bearing the notation "Encl. 1, Amend. No. 0001.

SECTION 01015 REVISED TECHNICAL**SECTION 01015****TECHNICAL REQUIREMENTS****1. GENERAL**

1.1 The Contractor's design and construction must comply with technical requirements contained herein. All requirements set forth in Section 01010, Scope of Work, but not included in the Technical Requirements, shall be considered as set forth in both, and vice versa. The Contractor shall provide design and construction using the best blend of cost, construction efficiency, system durability, ease of maintenance and environmental compatibility.

1.2 These design and product requirements are minimum requirements. The Contractor is encouraged to propose alternate design or products (equipment and material) that are more commonly used in the region; will be equally or more cost effective or allow for more timely completion, but furnish the same system durability, ease of maintenance and environmental compatibility. The Contractor will be required to submit information as requested by the Contracting Officer to make a comparison of the proposed alternate. All variations must be approved by the Contracting Officer.

1.3 ASBESTOS CONTAINING MATERIALS

Asbestos containing material (ACM) shall not be used in the design and construction of this project. If no other material is available which will perform the required function or where the use of other material would be cost prohibitive, a waiver for the use of asbestos containing materials must be obtained from the Contracting Officer.

1.4 SAFETY**1.4.1 Unexploded Ordnance (UXO)**

The requirements of this clause are in addition to and supplement EM 385-1-1, U.S. Army Corps of Engineers Safety and Health Requirements Manual. All mine and UXO clearing shall be done in accordance with the International Mine Action Standards (IMAS), and clearance shall be accomplished to the anticipated foundation depth. These standards may be found at <http://www.mineactionstandards.org/imas.htm>. If during the performance of the work under this contract, the Contractor encounters U.S. UXO, the Contractor shall immediately stop work in the area and either safely remove the item or notify the Contracting Officer.

NOTE: For previous demining information, the following points of contact from the UN Mine Action Center for Afghanistan are provided:

Reiko Kurihara, project manager, email reiko@unmaca.org
Cell phone: +93 070 284 686
Sandy Powell, chief Operations Officer, sandy@unmaca.org
Cell phone: +93 (0) 79 330 992

1.4.1.1 Unexploded Ordnance (UXO) Safety Support During Construction

It is the responsibility of the Contractor to be aware of the risk of encountering UXO and to take all actions necessary to assure a safe work area to perform the requirements of this contract. If after the entire site has been cleared of UXO/mines per the International Mine Action Standards (IMAS) and clearance is done to the anticipated foundation depth, the Contractor becomes aware of or encounters UXO or potential UXO during construction, the Contractor shall immediately stop work at the site of the encounter, move to a safe location, notify the COR, and

mitigate any delays to scheduled or unscheduled contract work. The Contractor shall remove and dispose of UXO's per the International Mine Action Standards (IMAS). These standards can be found at <http://www.mineactionstandards.org>. The Contractor assumes the risk of any and all personal injury, property damage or other liability, arising out of and resulting from any Contractor action hereunder. In these cases the contractor shall be required to identify and dispose of the ordnance.

1.4.1.2 Explosives Safety

1.4.1.2.1 General Safety Considerations

General safety considerations applicable to personnel, both essential and non-essential, at project sites where UXO may be encountered include:

- a. Do not carry fire or spark-producing devices.
- b. Do not conduct explosive or explosive-related operations without approved procedures and proper supervision and UXO safety support.
- c. Do not become careless by reason of familiarity with UXO or the reported probability level of UXO contamination.
- d. Do not conduct explosive or potentially explosive operations during inclement weather.
- e. Avoid contact with UXO except during UXO clearance operations.
- f. Conduct UXO-related operations during daylight hours only.
- g. Employ the "buddy system" at all times.

1.4.1.2.2 Activity Hazard Analysis (AHA) Briefings

- a. Activity Hazard Analysis's shall be prepared in accordance with the Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1.
- b. Hazard analyses will be prepared and briefed by personnel that are knowledgeable in UXO and explosives safety standards and requirements. These personnel should understand the specific operational requirement and hazard analysis methodologies. A hazard analysis will be performed for each activity to determine the significance of any potential explosive-related hazards. Explosive residues may be discovered or exposed during UXO operations in the form of powder or various granular and powder based pellets. These contaminants can enter the body through the skin or by ingestion if proper personal hygiene practices are not followed. Explosive fillers such as white phosphorus are dangerously reactive in air and acute exposure can result in serious injury to the skin, eyes, and mucous membranes. They are also a fire hazard.

Safety requirements (or alternatives) that will either eliminate the identified hazards, mitigate or control them to reduce the associated risks to an acceptable level will be developed. The adequacy of the operational and support procedures that will be implemented to eliminate, control, or abate identified hazards or risks will then be evaluated and a second risk assessment completed to verify that a satisfactory safety level has been achieved.

1.4.1.3 Notification of Noncompliance

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. The Contractor shall make no part of the time lost due to such stop orders the subject of claim for extension of time or for excess costs or damages.

1.5 LIMITATION OF WORKING SPACE

The Contractor shall, except where required for service connections or other special reasons, confine his operations strictly within the boundaries of the site. Workmen will not be permitted to trespass on adjoining property. Any

operations or use of space outside the boundaries of the site shall be by arrangement with all interested parties. It must be emphasized that the Contractor must take all practical steps to prevent his workmen from entering adjoining property and in the event of trespass occurring the Contractor will be held entirely responsible.

Areas located immediately outside the construction area are known to contain mines and unexploded ordnance (UXO). Contractors assume all risks when venturing in or out of the designated work area.

1.6 TEMPORARY STRUCTURES

The Contractor shall erect suitable temporary fences, lighting, and necessary structures to safeguard the site, materials and plant against damage or theft and for the protection of the general public and shall adequately maintain the same throughout the course of the contract.

1.7 SUBCONTRACTORS

Compliance with the provisions of this section by subcontractors will be the responsibility of the contractor.

1.8 LIST OF CODES AND TECHNICAL CRITERIA

The following codes and technical criteria and those referenced therein shall be required for this project. ***References within each reference below shall be required and adhered to.*** This list is not exhaustive and is not necessarily complete.

AABC - Associated Air Balance Council (National Standards for total System Balance)

Air Force Manual 32-1071, Security Engineering, volumes 1-4, 1 May 1994

American Water Works Association, ANSI/AWWA C651-99 standard

ARI - Air Conditioning and Refrigeration Institute

Army TM 5-853-1, Security Engineering, vols. 1 through 4, 12 May 1994

ASCE 7-02, Minimum Design Loads for Buildings and Other Structures, 2002

ASHRAE - American Society of Heating, Refrigeration and Air-Conditioning Engineers

ASME - American Society for Mechanical Engineering

ASTM - American Society for Testing and Materials

AWS - American Welding Society

EIA ANSI/TIA/EIA-607: (1994) Commercial Building Grounding/Bonding Requirement Standard.

Factory Mutual (FM) Approval Guide-Fire Protection (2002).

IBC - International Building Code (and its referenced codes including those inset below)

IMC – International Mechanical Code

IPC – International Plumbing Code

Lighting Handbook, IESNA, latest edition

Codes and Standards of the National Fire Protection Association (NFPA)

[as applicable and enacted in 2003, unless otherwise noted].

NFPA 10, Portable Fire Extinguishers, 2002 edition

NFPA 70, National Electrical Code, 2002 edition

NFPA 72, National Fire Alarm Code, 2002 edition

NFPA 90A, Air Conditioning and Ventilating Systems, 2002 edition

NFPA 101, Life Safety Code, 2003 edition

SMACNA - Sheet Metal and Air Conditioning Contractors' National Association

International Mine Action Standards, latest edition; see <http://www.mineactionstandards.org> for copy of standards.

UFC 1-200-01, Design: General Building Requirements, 31 July 2002

UFC 3-240-03, Operation and Maintenance: Wastewater Treatment System Augmenting Handbook

UFC 3-600-01, Design: Fire Protection Engineering for Facilities, 16 January 2004

UFC 4-010-01, Design: Minimum DoD Antiterrorism Standards for Buildings, 8 Oct 2003

UFC 4-010-02, DoD Minimum Antiterrorism Standoff Distances for Buildings, 8 Oct 2003

Underwriters' Laboratories (UL) Fire Protection Equipment Directory (2002).
USCINCCENT OPOD 97-1

The publications to be taken into consideration shall be those of the most recent editions. Standards other than those mentioned above may be accepted if the standards chosen are internationally recognized and meet the minimum requirements of the specified standards. The Contractor shall be prepared to submit proof of this if requested by the Contracting Officer.

2. SITE DEVELOPMENT:

The project includes furnishing all materials, equipment and labor for constructing water, sanitary sewer and storm sewer service lines, as applicable, and connecting to the existing sewer networks.

2.1 GEOTECHNICAL, FOUNDATIONS AND SURVEY

2.1.1 The foundations shall be constructed by using reinforced concrete materials. The foundations shall be strip footing type for continuous walls and spread type for individual column footings and shall be reinforced as required per design. Minimum strip footing width shall be 80cm and minimum depth shall be 80cm to meet frost requirement. The allowable bearing pressure shall be determined by the Contractor and be put in accordance with the Contractor's Geotechnical Investigation.

2.1.2 Site Specific Information.

Site specific geotechnical information necessary to design and construct the foundations, pavements and other geotechnically related items contained in this project shall be the contractor's responsibility. The contractor shall determine all necessary geotechnical conditions by appropriate field and laboratory investigations and supporting calculations. Minimum soil compaction shall be 95 percent of maximum density as defined in ASTM D 1557.

2.1.3 Geotechnical Report.

Geotechnical report shall contain field exploration and testing results, laboratory testing results, evaluations, recommendations, calculations and descriptive supporting text. Information in the report shall include, but not limited to: existing geotechnical (e.g. surface and subsurface) conditions, location of subsurface exploration logs, exploration point, foundations selected, bearing capacity, ground water levels, and construction materials (e.g. concrete cement, asphalt, and aggregates). Two copies of the detailed geotechnical report shall be submitted to the Contracting Officer.

2.1.4 Geotechnical Qualifications.

A geotechnical engineer or geotechnical firm responsible to the contractor shall develop all geotechnical engineering design parameters. The geotechnical engineer or geotechnical firm shall be qualified by: education in geotechnical engineering; professional registration; and a minimum of ten (10) years of experience in geotechnical engineering design.

2.1.5 Design Certification.

The contractor shall certify in writing that the design of the project has been developed consistent with the site-specific geotechnical conditions. The certification shall be stamped by the geotechnical engineer of the geotechnical firm and shall be submitted with the final design.

2.1.6 PRESUMPTIVE GEOTECHNICAL PARAMETERS

The following design parameters are for information only. It is the contractor's responsible to field verify these parameters. If the contractor adopts these parameters, he assumes full responsibility for their use in design and construction.

2.1.6.1 Soil Parameters

Typical values for silt: moist unit weight: 17 kN/m^3 ; cohesion: 0 kg/cm^2 ; and effective friction angle: 28 degrees.

Typical values for sand moist unit weight: 18 kN/m^3 ; cohesion: 0 kg/cm^2 ; and effective friction angle: 30 degrees.

2.1.6.2 Foundations

Frost depth is a minimum of 80 cm below grade. Footings should be placed below this level. The typical bearing pressure is about 1.5 kg/cm^2 . This is for sand, dry silt or hard clay.

2.1.6.3 Percolation Rates

The fine sand and silt have low permeability. It will take a very long time for water to percolate through the soil. Percolation rates are on the order of days. Additionally, any large volume of water at the surface may runoff before it can seep into the ground.

2.1.6.4 Satisfactory and Unsatisfactory Material

Satisfactory material should be gravel, clean sand, silt or low plasticity clay, composed of satisfactory soils or aggregates defined in ASTM D 2487 as GW, GP, GM, SP, SM, SW, CL-ML.

Unsatisfactory material is high plasticity clay, high plasticity silt; moderate to highly expansive soils; organics; and similar soil types (MH, CH, OL, OH). All foreign objects and other undesirable material (shells, bombs, debris, etc.) should be avoided. The gradations will be determined by use and source availability. Fill should be satisfactory material.

2.1.6.5 Excavations

Excavation cuts should be sloped 1.5 H to 1.0 V. Vertical cuts are not permitted for excavations deeper than 1.5m (5 feet)). Bracing may be required depending upon soil conditions and excavated depth. Use a coefficient of active earth pressure of 0.3 for moist sand and 0.4 for moist silt when designing excavation bracing. Utilities should be placed below minimum frost depth of 80 cm. These values assume dry working conditions.

2.1.7 SURVEY AND MAPPING

2.1.7.1 General Work to be performed - Conduct topographic survey, mapping and documentation of the project site to include surface physical features, buildings, existing utilities, hydrological, geological, botanical or other physical conditions that could impact design. Topographic survey data shall include horizontal and vertical (H&V) controls. The limits of the survey shall be 10 meter outside of the anticipated graded area and 15 meter wide along utility lines to be replaced. The contractor shall obtain the original survey map prepared prior to construction and incorporate the new survey data for all new facilities.

2.1.7.2 For Horizontal and Vertical Control, the surveyor shall use established monuments, if available. If monuments have been destroyed or do not exist, the mapping shall be based on WGS84 geodetic system and converted to UTM coordinates. All site plans and master plans shall be drawn in the following projection and datum for incorporation into the U.S. Army Corps of Engineers GIS system: WGS 1984 UTM Zone 42 N. The horizontal and vertical control established on site shall be a closed loop with third order accuracy and procedures.

2.1.7.3 All of the existing control points used at the site shall be plotted at the appropriate coordinate point and shall be identified by name or number, and adjusted elevations.

2.1.7.4 Demolition shall include removal of all structures, foundations, pavements, and utilities, and clear and grubbing. All refuse and debris shall be disposed of off site. Holes and depressions shall be backfilled.

2.2 ENVIRONMENTAL PROTECTION

2.2.1 Applicable Regulations

The Contractor shall comply with all Host Nation laws, rules, regulations or standards concerning environmental pollution control and abatement with regard to discharge of liquid waste into natural streams or manmade channels. The contractor shall review host nation and U.S. Government environmental regulations with the contracting officer prior to design and discharge of any liquid wastes into natural streams or manmade channels.

2.2.2 Notification

The Contracting Officer will notify the Contractor in writing of any observed non-compliance with the foregoing provisions. The Contractor shall immediately take corrective action. If the Contractor fails or refuses to promptly take corrective action, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No extension of time or damages will be awarded to the Contractor unless it was later determined that the Contractor was in compliance.

2.2.3 Spillages

Measures shall be taken to prevent chemicals, fuels, oils, greases, bituminous materials, waste washings, herbicides and insecticides, and construction materials from polluting the construction site and surrounding area.

2.2.4 Disposal

Disposal of any materials, wastes, effluents, trash, garbage, oil, grease, chemicals, etc., shall be taken to a dumpsite off site and subject to the approval of the Contracting Officer. Burning at the project site for the disposal of refuse and debris will not be permitted.

2.3 CIVIL SITE DEVELOPMENT

2.3.1 Site Plan

The contractor shall locate the facilities in general agreement with the drawings included and any requirements in the Scope of Work 01010. All buildings, roads, parking areas, entry control points, guard towers, fence, utility structures, and other site features shall be clearly defined and dimensioned on the site plan. Buildings shall be located to provide access for emergency vehicles and fire fighting. Roads and parking areas shall be designed for turning radius of the largest vehicle entering the compound.

2.3.2 Demolition

Demolition shall include removal of all structures, foundations, pavements, and utilities, and clear and grubbing. All refuse and debris shall be disposed of off site. Holes and depressions shall be backfilled. Fill materials shall be composed of satisfactory soils or aggregates defined in ASTM D 2487 as GW, GP, GM, SP, SM, SW, CL-ML. Minimum soil compaction shall be 95 percent of maximum density as defined in ASTM D 1557.

2.3.3 Grading and Drainage

The contractor will provide all necessary site grading to insure adequate drainage so that no areas will be flooded due to a rainfall of a 10-year frequency. Drainage of the area should be compatible with the existing terrain. Building floor elevations shall be a minimum 150 mm above grade and slope away from the building on all sides at a minimum of 2%.for 7 meters.

2.3.4 Paving

2.3.4.1 Roads

Paved roads are required within the compound. All roads shall be of wearing surface 7.3 meters (24 feet) wide, unless otherwise noted, graded for proper drainage, provided with necessary drainage structures and completed with prescribed surfaces in accordance with applicable sections of TM 5-822-2 and TM 5-822-5 standards. The compound roads sections shall have 200 mm (8 inch) compacted base course minimum and shall be surfaced with minimum 50 mm (2 inch) hot mix asphaltic concrete, unless otherwise noted. Contractor shall notify the Contracting Officer immediately if initial site survey determines that area hydrology requires major drainage structures or bridges.

2.3.4.2 Bridges and Site Grading Plan

Preliminary investigation indicates no need for bridges or major drainage structures. The Contractor shall notify the Contracting Officer immediately if initial site survey determines that area hydrology requires major drainage structures or bridges. The contractor shall design a site grading plan that provides positive drainage and minimizes the requirement for major structures in a cost effective manner. Drainage shall be designed for a 10 year storm frequency.

2.3.4.3 Parking Areas and Motor Pools

Contractor shall construct parking and storage areas using aggregate surface. Subgrade shall be 150mm (6 inches) minimum in depth scarified and compacted to 95% proctor density. Aggregate surfacing shall be 150mm (6 inches). Aggregate surfacing material must be well graded, durable aggregate uniformly moistened and mechanically stabilized by compaction. Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 or equivalent DIN, BS, or EN standards. A 3 meter wide 200 mm thick concrete apron shall be provided for the entrance and exit to the motor pool garage building. The concrete joint spacing shall not exceed 4.0 M. The length to width ratio shall not exceed 1.25% with out reinforcement. Reinforcement shall be 8mm 300mm on center each way. The concrete strength to support vehicles shall be a minimum of 316 kg/sq. cm (4500 PSI), 28-day break, by the test procedure presented in ASTM C 31M.

2.3.4.4 Sidewalks shall be provided to connect parking areas with buildings and adjoining buildings where foot traffic is anticipated. Sidewalks shall be constructed of Portland cement concrete and be at least 1.5 meters wide and 100 mm thick. Sidewalk used subject to vehicular traffic shall be 150mm thick. The sidewalk concrete strength shall be 210 kg/sq cm (2890 psi) as stated in paragraph [4.12](#).

2.3.5 Masonry/Stone Compound Walls

2.3.5.1 Exterior Compound Wall

Exterior compound security walls shall be constructed as a multi-wythe, reinforced concrete masonry unit wall structure with an exterior stucco finish on both sides, or a single wythe, reinforced masonry unit wall with a native stone veneer anchored to the masonry unit core. The minimum wall thickness specified in section 01010 shall be measured as the total thickness of the concrete masonry unit wythes without the stucco finish, or at the spot of the least cross sectional thickness of the masonry and stone veneer wall. The thickness of the single wythe masonry core of the masonry/stone wall shall be determined based on the structural load requirements as to dead, live, wind and seismic loads to be resisted by the wall. The wall shall be coped with either a stone coping or a pre-cast concrete coping, with a smooth dense finish. Copings shall be cast sloped to drain water away. Stone for the veneer or coping shall be either limestone, sandstone or granite. Coping shall be installed in a full mortar bed.

The masonry or masonry/stone veneer compound wall shall designed to meet the seismic building code. Materials shall meet the structural strength standards in the Structural section of this specification. As a minimum the wall shall have steel reinforcing bars spaced at a maximum spacing of 0.609m (24 inches) vertically and 1.219m (48 inches) horizontally. As a minimum all cells containing reinforcing bars shall be grouted.

Storage of masonry materials shall be in a dry place or materials shall be covered with a plastic protective layer.

Cover open walls each day to keep them protected and dry. Concrete masonry units (CMU) shall be 100 mm, 200mm or 300mm wide x 400mm long x 200mm high as required to achieve the required wall thickness set in Section 01010 and meet the structural requirements set below. The surface shall be free of chips, cracks, or other imperfections that would detract from the overall appearance of the finished wall. Defective concrete masonry units or mortar shall be rejected. Concrete masonry units shall be installed in running bond level and plumb. Mortar shall meet the requirements of ASTM C 270, Type S. Mortar joints shall be 10mm on all sides between CMU. Joints shall be struck with a concave tool to provide a smooth recessed curved surface on exposed masonry walls and struck flush cut on surfaces which will have a stucco or stone veneer finish applied. Grout shall conform to ASTM C 476 or C 94. Bond multi-wythe concrete masonry units together with 5mm thick, wire rectangular wall ties. Stone veneer shall be anchored to the inner concrete masonry wythe with masonry anchors. Horizontal joint reinforcement shall be installed at 400mm on center.

2.3.5.2 Gates

The gates shall be either hinged or sliding type. Hinged gates shall be a pair of 2m wide x 3m high leafs, constructed of a steel tube frame and steel tube intermediate posts and rails. Each leaf framework shall have a min. 16 gage steel plate attached to it. The design of the gates shall insure that it is dimensionally stable, square, true and planar. Gate leafs shall not rack or deflect when install on its hinges. Gates shall have a sufficient number of hinges, anchor mounted to the exterior masonry walls, to support each gate leaf. Provide a locking mechanism that holds the gates together when in the closed position as well as a drop bolt that engages a steel sleeve embedded in the pavement. Sliding gates shall have a concrete slab for the bottom roller to run on.

2.3.5.3 Reinforced Barber Tape

Reinforced barbed tape shall be 600 mm diameter concertina style coil consisting of 31 loops. Each loop shall consist of 19 barb clusters per loop. Adjacent coils loops shall be alternately clipped together at three points about the circumference to produce the concertina effect upon deployment. Spacing between attachments points when deployed shall be 400 mm. The reinforced barbed tape shall be fabricated from 430 series stainless steel with a hardness range of Rockwell (30N) 37-45 conforming to the requirements of ASTM A 176. Each barb shall be a minimum of 30.5 mm (1.2 inch) in length, in groups of 4, spaced on 102 mm (4 inch) centers. The stainless steel core wire shall have a 2.5 mm (0.098 inch) diameter with a minimum tensile strength of 895 MPa. Sixteen gauge stainless steel twistable wire ties shall be used for attaching the barbed tape to the barbed wire. The reinforced barbed tape shall be equivalent to NSN: 5660-01-457-9852.

2.3.5.4 Outriggers

Outrigger supporting arms shall be “Y” shaped with post securely embedded into the top of the wall. Posts shall conform to ASTM F 1083, Pipe, Steel, Hot Dipped Zinc Coated (Galvanized) Welded.

2.3.5.5 Vehicle Barriers

Active vehicle barriers shall be wedge pop-up type mechanical barriers. The barrier shall be capable of stopping a 6810 kg vehicle moving at 80 kph. Barrier shall be the product of a manufacture regularly engaged in the manufacture vehicle barrier of similar type and size.

2.3.6 CIVIL UTILITIES

2.3.6.1 General

The design of the water and sanitary systems shall be sized to provide flow and discharge based on a fixture unit basis. The design drawings shall show all utility lines, line sizes, valves, manholes, disinfection systems, and applicable details associated with water and sanitary system designs. Specifications covering water lines, valves, pumps, controls, sanitary sewers and storm sewers shall be submitted as part of the design and shall require standard materials that are available in-country. Contractor shall install and connect exterior sanitary sewer collection and water supply piping to service connection points of each facility.

2.3.6.2 WATER

2.3.6.2.1 General

Infrastructure design and construction shall serve the demand. The Contractor shall install water distribution mains, branches, laterals, lines and service connections to include all pipe, valves, fittings and appurtenances. Exterior water line construction shall include service to all buildings as described in the Scope of Work Section 01010. The required Average Daily Demand (ADD) approximation is derived from 155 liters per capita per day (lpcd) or 41 gallons per capita per day (gpcd). In the event potable or non-potable use water is required prior to completion of the water facilities infrastructure the Contractor may be issued a Request for Proposal to provide non-potable (tank truck) and potable (bottled or other reliable source) consumption. Provide a minimum of one (1) outside water hydrant (hose spigot) the administration building, dinning facility, toilet, shower, sink and laundry building and motor pool.

2.3.6.2.2 Water Quality Sampling and Analysis

The Contractor shall perform water quality sampling and testing at the source. The Contractor shall utilize well-qualified and equipped testing capability in the project site area, if available. If professional testing services are not available in the area, the Contractor will submit an alternative practical testing source for approval. Raw water quality criteria for Water Quality and Criteria Standards, and shall address the following: PH, turbidity, conductivity, oxidation reduction potential, total dissolved solids, color, odor, total coliform/fecal coliform (bacteria) an indicator of the presence of E. coli. These baseline parameters are a partial list as presented in TM5-813-3/AFM 88-10.

2.3.6.2.3 Water Well

The contractor shall design and construct water well(s) to provide sufficient supply for the facility. Wells shall be capable of supplying one day demand with 16 hours of pumping time. Well construction shall be in accordance with AWWA A100 Water Wells.

2.3.6.2.4 Well House

Construct a permanent well house with concrete slab floor at existing well. The floor of the well house shall slope away from the casing approximately 2 cm per 30 cm (1/8" per foot). Floor of well house shall be above flood plain and 150 mm above exterior grade. The well house design should be such that the well pump, water tank, motor and drop pipe could be removed readily. The well house shall protect valves and pumping equipment plus provide freeze protection for the pump discharge piping beyond the check valve. The well house shall be insulated and a heating unit installed. The well shall be protected from unauthorized use by a security fence with lockable gate. Provide outriggers, barbed wire and concertina wire on fence and gate.

2.3.6.2.5 Raw Water Disinfection

Contractor shall perform disinfection of the well water in accordance with AWWA A 100 or equivalent. Bacteriological samples shall be collected and examined in accordance with Standard Methods for the Examination of Water and Wastewater by a qualified lab as approved by the Contracting Officer.

2.3.6.2.6 Water Storage Tank

Contractor shall provide a water tank has sufficient capacity to support the new development. Booster pumps will be provided as required. Total volume of the tank(s) shall be a minimum storage volume of a full days demand. The Contractor shall verify storage volume requirements based on final design population.

2.3.6.2.7 Disinfection & Chlorination System

Use hypochlorite compounds for disinfection. A hypo-chlorinator shall be used to feed a sodium hypochlorite solution of 5-15% available chlorine into the system. Hypochlorite compound may be a liquid or solid form. The hypo chlorination system shall consist of a chemical solution tank for hypochlorite, diaphragm-type pump, power supply, water pump, pressure switch and storage tank (optional hydro-pneumatic/storage). The pump shall feed a hypochlorite solution in proportion to the water demand. The hypo-chlorinator shall have a pumping rate, liters per day (lpd) (gallons per day (gpd)) adequate to deliver 5 percent (%) available hypochlorite solution adjustable to the quantity of water being produced from the source. Dosage rate will vary somewhat depending on actual pump production rate and available residual chlorine in the system. Contractor shall determine the required dosage rate milligrams per liter (mg/l) to maintain the required chlorine residual (usually 0.2-0.4mg/l) in the distribution system. Chlorine solution tank shall be large enough to hold a three days supply of hypochlorite solution. A fresh solution shall be prepared every two or three days because the solution may lose its strength over time and this will affect the actual chlorine feed rate. The hypochlorite shall be stored in a cool dry place. Sodium hypochlorite can lose from two to four percent of its available chlorine content per month at room temperature. Contractor shall verify required minimum residual chlorine in accordance with local requirements verified and approved by the Contracting Officer. The chlorination system shall have the capability for manually adjusting the dosage rate and be installed in such a manner that the system can be easily disconnected and bypassed in the event of health safety or routine maintenance and repair. Disinfection of water mains shall be in accordance with AWWA standard C651-86 and disinfection of storage facilities in accordance with AWWA standard C652

2.3.6.2.8 Chlorine Shelter

Contractor shall furnish a shelter as per chlorine manufacturer's installation requirements. The Contractor shall provide manufacturers catalog information and shop drawing to the Contracting Officer for approval.

2.3.6.3 WATER DISTRIBUTION SYSTEM

2.3.6.3.1 General

The Contractor shall provide a water distribution system described as follows: Pipe diameters used in the network shall be 150mm (6 inch), 100mm (4 inch) and 50 mm as calculated, using ductile iron (DI) conforming to AWWA C151, installed in accordance with C 600 or polyvinyl chloride (PVC) as per ASTM D 1784 and 1785. All pipes and joints shall be capable of at least of 690kPa (75psi) test pressure unless otherwise specified. Pipes should be adequate to carry the maximum quantity of water at acceptable velocities 0.9 to 1.5m/sec (3 to 5 ft/sec) at maximum flows not to exceed 2.8m/sec (9.2ft/sec) with working pressures of 240kPa (35psi) to 350kPa (50psi). Minimum pressure is 140kPa (20psi) to all points of the distribution system and maximum pressure of 690kPa (75psi). Water service connections to buildings shall vary from 19mm, 25mm or 38mm to 75mm, as calculated, depending on the usage requirement. Pipe service connections from the distribution main to the building shall be either Polyvinyl Chloride (PVC) plastic Schedule 80 ASTM D 1785 or copper tubing conforming to ASTM B 88M, Type K, annealed. After choosing piping material type, use similar piping materials for all buildings for efficiency of future maintenance activities. The distribution network shall be laid out in a combination grid and looped pattern with dead ends not exceeding 30m (99 feet). Dead end sections shall not be less than 150mm (6 inch) diameter and shall have blow off installed for periodic flushing of the line. Water supply distribution shall connect to the building service at a point approximately 1.5m (5 feet) outside the building or structure to which the service is required to have a shutoff valve shall be installed. Adequate cover must be provided for frost protection. A minimum cover of 800mm (2'-8") is required to protect the water distribution system against freezing. Water lines less than 1.0 meters (3.1 feet) deep under road crossings shall have a reinforced concrete cover of at least 150 mm (6 inch) thickness around the pipe.

2.3.6.3.2 Pipe

The Contractor shall provide pipe of adequate strength, durability and be corrosion resistant with no adverse effect on water quality. The exterior surface of the pipe must be corrosion resistant. If the pipe is installed underground pipe shall be encased with polyethylene in accordance with AWWA C105. Water distribution pipe material shall be

PVC or Ductile Iron (DI). Ductile iron pipe shall conform to AWWA C104, etal. DI fittings shall be suitable for 690kPa (75psi) pressure unless otherwise specified. Fittings for mechanical joint pipe shall conform to AWWA C110. Fittings for use with push-on joint pipe shall conform to AWWA C110 and C111. Fittings and specials shall be cement mortar lined (standard thickness) in accordance with C104. Polyvinyl Chloride (PVC) pipe shall conform to ASTM D 1785. Plastic pipe coupling and fittings shall be manufactured of material conforming to ASTM D 1784, Class 12454B. PVC screw joint shall be in accordance with ASTM D 1785, etal, Schedules 40, 80 and 120. PVC pipe couplings and fittings shall be manufactured of material conforming to ASTM D 1784, Class 12454B. Pipe less than 80mm (3 inch), screw joint, shall conform to dimensional requirements of ASTM D schedule 80. Elastomeric gasket-joint, shall conform to dimensional requirements of ASTM D 1785 Schedule 40, All pipe and joints shall be capable of 690kPa (75psi) working pressure.

2.3.6.3.3 Hydrostatic, Leakage and Disinfection Tests

The Contracting Officer will be notified not less than 48 hours in advance of any water piping test and will be given full access for monitoring testing procedures and results. Where any section of water line is provided with concrete thrust blocking for fittings or hydrants tests shall not be made until at least 5 days after installation of the concrete thrust blocking, unless otherwise approved.

2.3.6.3.4 Pressure Test

After the pipe is laid, the joints completed, and the trench partially backfilled leaving the joints exposed for examination, the newly laid piping or any valve section of piping shall, unless otherwise specified, be subjected for 1 hour to a hydrostatic pressure test of 690kPa (75psi). Each valve shall be opened and closed several times during the test. Exposed pipe, joints, fittings, hydrants and valves shall be carefully examined during the partially opened trench test. Joints showing visible leakage shall be replaced or remade as necessary. Cracked or defective pipe, joints, fittings, hydrants and valves discovered following this pressure test shall be removed and replaced and retested until the test results are satisfactory.

2.3.6.3.5 Leakage Test

Leakage test shall be conducted after the pressure tests have been satisfactorily completed. The duration of each leakage test shall be at least 2 hours and during the test the water line shall be subjected to not less than 690kPa (75psi). Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valve or approved section, necessary to maintain pressure to within 34.5kPa (5 psi) of the specified leakage test pressure after the pipe has been filled with water and the air expelled. Pipe installation will not be accepted if leakage exceeds the allowable leakage, which is determined by the following formula:

$L = 0.0001351ND (P \text{ raised to } 0.5 \text{ power})$ L = Allowable leakage in gallons per hour N = Number of joints in the length of pipeline tested D = Nominal diameter of the pipe in inches P = Average test pressure during the leakage test, in psi gauge

Should any test of pipe disclose leakage greater than that calculated by the above formula, the defective joints shall be located and repaired until the leakage is within the specified allowance, without additional cost to the government.

2.3.6.3.6 Bacteriological Disinfection

2.3.6.3.6.1 Disinfection Procedure

Before acceptance of potable water operation, each unit of completed waterline shall be disinfected as prescribed by AWWA C651. After pressure tests have been completed, the unit to be disinfected shall be thoroughly flushed with water until all entrained dirt and mud have been removed before introducing the chlorinating material. Flushing will be performed in a manner and sequence that will prevent recontamination of pipe that has previously been

disinfected. The chlorinating material shall be liquid chlorine, calcium hypochlorite, or sodium hypochlorite. The chlorinating material shall provide a dosage of not less than 50 ppm and shall be introduced into the water lines in an approved manner. Polyvinyl Chloride (PVC) pipelines shall be chlorinated using only the above-specified chlorinating material in solution. The agent shall not be introduced into the line in a dry solid state. The treated water shall be retained in the pipe long enough to destroy all non-spore forming bacteria. Except where a shorter period is approved, the retention time shall be at least 24 hours and shall produce not less than 25 ppm of free chlorine residual throughout the line at the end of the retention period. Valves on the lines being disinfected shall be opened and closed several times during the contact period. The line shall then be flushed with clean water until the residual chlorine is reduced to less than 1.0 ppm. During the flushing period, each fire hydrant on the line shall be opened and closed several times.

2.3.6.3.6.2 Sampling

For each building connected to the water system, personnel from the Contractor's commercial laboratory shall take at least 3 water samples from different points, approved by the Contracting Officer, in proper sterilized containers and perform a bacterial examination in accordance with approved methods. The commercial laboratory shall be verified to be qualified by the appropriate authority for examination of potable water.

2.3.6.3.6.3 Acceptance Requirements

The disinfection shall be repeated until tests indicate the absence of pollution for at least two full days. The unit will not be accepted until satisfactory bacteriological results have been obtained.

2.3.6.3.7 Time for Making Tests

Except for joint material setting or where concrete thrust blocks necessitate a 5-day delay, pipeline jointed with rubber gaskets, mechanical or push-on joints, or couplings may be subjected to hydrostatic pressure, inspected and tested for leakage at any time after partial completion of backfill.

2.3.6.3.8 Concurrent Tests

The Contractor may elect to conduct the hydrostatic tests using either or both of the following procedures. Regardless of the sequence of tests employed, the results of pressure tests, leakage tests, and disinfection shall be recorded for submission and approval. Replacement, repair or retesting required shall be accomplished by the Contractor at no additional cost to the Government.

- a. Pressure test and leakage test may be conducted concurrently,
- b. Hydrostatic tests and disinfection may be conducted concurrently, using water treated for disinfection to accomplish the hydrostatic tests. If water is lost when treated for disinfection and air is admitted to the unit being tested, or if any repair procedure results in contamination of the unit, disinfection shall be re-accomplished.

2.3.6.3.9 Valves

Valves (Gate valves w/box) shall be placed at all pipe network tees and cross intersections and the number of valves shall be one less than the number of lines leading into and away from the intersection. For isolation purposes valves shall be spaced not to exceed 60 M (200 feet). Gate valves shall be in accordance with AWWA C 500 and/or C509. The valves and valve boxes shall be constructed to allow a normal valve key to be readily used to open or close the valve. Provide traffic-rated valve boxes. Provide concrete pad, 1 meter (3'-4") square, for all valve boxes.

2.3.6.3.10 Vacuum and Air Release Valves

Air release valves are required to evacuate air from the main high points in the line when it is filled with water, and to allow the discharge of air accumulated under pressure. Vacuum relief valves are needed to permit air to enter a

line when it is being emptied of water or subjected to vacuum. Contractor shall submit manufacturer's data for properly sized combination air and vacuum release valves and determine their locations on the distribution system subject to review and approval of the Contracting Officer.

2.3.6.3.11 Blow-off valves

The Contractor shall provide 40-50mm (1-5/8" – 2") blow-off valves at ends of dead end mains. Valves should be installed at low points in the mains where the flushing water can be readily discharged to natural or manmade drainage ditches, swales or other.

2.3.6.3.12 Thrust Blocking

Contractor shall provide concrete thrust blocking at any point where the layout of the system changes the direction of the flow, increases the velocity, or decreases or stops the flow. At these points, the pipes and fittings must be anchored and kept from moving or pulling apart by the use of thrust blocks installed against undisturbed earth.

2.3.6.4 SANITARY SEWER

2.3.6.4.1 General

There are no functional or salvageable sanitary sewer collection, treatment or disposal facilities at this site. The Contractor shall obtain topographic information or other maps that show vegetation, drainage channels and other land surface features such as underground utilities and related structures that may influence the design and layout of the collection system.

The contractor shall provide a sanitary sewer system as included in the Scope of Work 01010. Average Daily sewer water flow at residential and office facility shall be based on a per capita flow of 41 liters. Flow at dining facilities shall be based on 10 liters per capita use and 41 liters per employee. A sanitary sewer collection system shall be provided for each facility with water service. All lines, service connections, manholes, pump stations, and other required structures shall be provided. Gravity sewer connection to the buildings shall be 150 millimeters. Slope shall be provided to produce a minimum velocity of 0.6 meters per second at average daily flow. Gravity line pipe shall meet or exceed the requirements of ASTM D3034 SDR 35.

Exterior sanitary sewer line construction shall include service to all buildings as described in the Scope of Work Section 01010. Contractor shall design sanitary sewer collection system using approved field survey data and finished floor elevations. Depending upon the topography and building location, the most practical location of sanitary sewer lines is along one side of the street. In other cases they may be located behind buildings midway between streets. Main collection sewers will follow the most feasible route to the point of discharge. The sewer collection system shall be designed to accommodate the initial occupancy and a 50% expansion capability. All sewers shall be located outside of the roadways as much as practical, and minimize the number of roadway crossings. A sewer from one building shall not be constructed under another building, or remain in service where a building is subsequently constructed over it. Construction required shall include appurtenant structures and building sewers to points of connection with building drains 1.5m (5 feet) outside the building to which the sewer collection system is to be connected.

The Contractor shall use the following criteria where possible to provide a layout which is practical, economical and meets hydraulic requirements: 1) Follow slopes of natural topography, 2) avoid routing sewers through areas which require extensive restoration or underground demolition, 3) Avoid areas of high groundwater and placement of sewer below the groundwater table, 4) locate manholes at change in direction, size or slope of gravity sewers, 5) use straight sections between manholes, curved alignment shall not be permitted, 6) locate manholes at intersections of streets where possible, 7) avoid placing manholes where the tops will be submerged or subject to surface water inflow, 8) evaluate alternative sewer routes where applicable, 9) verify that final routing selected is the most cost effective alternative that meets service requirements. In the event that facilities to be provided under the contract must be occupied prior to completion of permanent wastewater infrastructure, the Contractor will be responsible for

providing temporary portable shower and bathroom facilities.

The sewage water storage tanks shall be below grade reinforced concrete or other tanks as approved by the contracting officer, and shall be sized to hold three days flow. The contractor will evaluate alternate methods of disposal as to the feasibility of use, and employ such alternatives based on the individual locations. If underground holding tanks are used, then a 200 mm concrete paved truck loading area shall be provided at each tank.

2.3.6.4.2 Protection of Water Supplies

The Contractor shall ensure that the sewer design meets the following criteria:

2.3.6.4.2.1 Sanitary sewers shall be located no closer than 15m (50 feet) horizontally to water wells or reservoirs to be used for potable water supply.

2.3.6.4.2.2 Sanitary sewers shall be no closer than 3m (10 feet) horizontally to potable water lines; where the bottom of the water pipe will be at least 300mm (12 inches) above the top of the sanitary sewer, horizontal spacing shall be a minimum of 1.8m (6 feet).

2.3.6.4.2.3 Sanitary sewers crossing above potable water lines shall be constructed of suitable pressure pipe or fully encased in concrete for a distance of 2.7m (9 feet) on each side of the crossing. Pressure pipe will be as required for force mains in accordance with local standards and shall have no joint closer than 1 meter (3 feet) horizontally to the crossing, unless the joint is encased in concrete.

2.3.6.4.3 Quantity of Wastewater

The Contractor shall verify the average daily flow considering both resident (full occupancy) and non-resident (8hr per day) population. The average daily flow will represent the total waste volume generated over a 24-hour period, and shall be based on the total population of the facility and usage rate of 41 gallons per capita day (water usage) plus additional capacity for the dining facility. The wastewater flow rate shall be calculated as approximately 80% of water usage rate. Design criteria guideline shall be based on an average influent wastewater characteristics as BOD of 400mg/l, SS of 400mg/l, BOD load of 750ppd, and SS load of 750ppd.

2.3.6.4.4 Gravity Sewer

Sanitary sewers shall be designed to flow at 50 to 95 percent full. Sanitary sewer velocities shall be designed to provide a minimum velocity of 0.6 meters per second (mps) or 2.0 feet per second (fps) at the ADD flow rate and a minimum velocity of 0.8 to 1.05 mps (2.5-3.5fps) at the peak diurnal flow rate. In no case shall the velocity drop below 0.3 mps, (1.0 fps) to prevent settlement of organic solids suspended in the wastewater. Pipe slopes shall be sufficient to provide the required minimum velocities and depths of cover on the pipe. Unless otherwise indicated (see Building Connections and Service Lines), gravity sewer pipe shall be installed in straight and true runs in between manholes with constant slope and direction. Adequate cover must be provided for frost protection. A minimum cover of 800 mm (2'-8") will be required to protect the sewer against freezing.

2.3.6.4.5 Manholes

The Contractor shall provide standard depth manholes (MH), (depth may vary) an inside dimension of 1.2 meters (4 feet). Manholes shall be made of cast-in-place reinforced concrete with reinforced concrete cover. Alternate precast manhole option shall taper to a 750 mm (30-inch) cast iron frame that provides a minimum clear opening of 600 mm (24 inches). In every case, the manholes, frames and covers shall be traffic rated, H-20 load rating. All manholes shall be provided with a concrete bench with a flow line trough, smoothly formed to guide waste flow to the outlet pipe from the inlet pipe(s). The top surface of the bench shall be above the crown of all pipes within the manhole. All surfaces of the bench shall be sloped smoothly toward the trough to guide flow, even under peak flow conditions.

2.3.6.4.5.1 Manhole Design Requirements

Manholes are required at junctions of gravity sewers and at each change in pipe direction, size or slope, except as noted hereinafter for building connections.

2.3.6.4.5.2 Spacing

The distance between manholes must not exceed 90 m (300 ft) in sewers of less than 460 mm (18 inches) in diameter

2.3.6.4.5.3 Pipe connections

The crown of the outlet pipe from a manhole shall be on line with or below the crown of the inlet pipe.

2.3.6.4.5.4 Pipe

Pipe shall conform to the respective specifications and other requirements as follows: Provide Polyvinyl Vinyl Chloride (PVC) conforming to ASTM D 3034, Type PSM with a maximum SDR of 35, size 380 mm (15inch) or less in diameter. PVC shall be certified as meeting the requirements of ASTM D 1784, cell Class 12454 B.

2.3.6.4.5.5 Fittings

Fittings shall be compatible with pipe supplied and shall have a strength not less than that of the pipe. Fittings shall conform to the respective specifications and requirements as follows: provide PVC fittings conforming to ASTM D 3034 for type PSM pipe.

2.3.6.4.5.6 Joints

Joints installation requirements shall comply with the manufacturers installation instructions. Flexible plastic pipe (PVC or high density polyethylene pipe) gasketed joints shall conform to ASTM D3212.

Branch connections shall be made by use of regular fittings or solvent-cemented saddles as approved. Saddles for PVC pipe shall conform to Table 4 of ASTM D 3034.

2.3.6.4.5.8 Frames and Covers

Frames and covers shall be cast iron, ductile iron or reinforced concrete, traffic rated in any case to an H-20 load rating. Cast iron frames and covers shall be traffic rated, circular with vent holes.

2.3.6.4.5.9 Steps for Manholes

Steps shall be cast iron, polyethylene coated, at least 15 mm (5/8 inch) thick, not less than 400mm (16 inches) in width, spaced 300 mm (12 inches) on center.

2.3.6.4.5.10 The minimum depth of cover over the pipe crown shall be 0.8 m (2'-8").

2.3.6.4.6 Building Connections and Service Lines

Building connections and service lines will be planned to eliminate as many bends as practical and provide convenience in rodding. Bends greater than 45 degrees made with one fitting should be avoided; combinations of elbows such as 45-45 or 30-60 degrees shall be used with a cleanout provided. Connections to other sewers will be made directly to the pipe with standard fittings rather than through manholes. However, a manhole must be used if the connection is more than 31m from the building cleanout. Cleanouts shall be provided outside of the building. Service connection lines will be a minimum of 100 mm (4 inch) diameter and laid at a minimum 1% grade, but up to 2% as design parameters dictate. Service laterals shall be 150 mm (6 inch) and sloped to maintain the minimum

velocity as described in paragraph "Gravity Sewer."

2.3.6.4.7 Cleanouts

Cleanouts must be installed on all sewer-building connections to provide a means for inserting cleaning rods into the underground pipe. Install manufactured wye fittings. In lieu of a wye fitting, an inspection chamber may be installed. The inspection chamber shall be of the same construction as a manhole. Preferably the cleanout will be of the same diameter as the building sewer, and never be smaller than 100 mm (4 inch).

2.3.6.4.8 Field Quality Control

2.3.6.4.8.1 Field Tests and Inspections

2.3.6.4.8.2 The Contracting Officer will conduct field inspections and witness field tests specified in this section. The Contractor shall perform field tests and provide labor, equipment and incidentals required for testing.

2.3.6.4.8.3 Check each straight run of pipeline for gross deficiencies by holding a light in a manhole; it shall show a practically a full circle of light through the pipeline when viewed from the adjoining end of the line. When pressure piping is used in a non-pressure line for non-pressure use, test this piping as specified for non-pressure pipe.

2.3.6.4.8.4 Test lines for leakage by either infiltration tests or exfiltration tests. Prior to testing for leakage, backfill trench up to at least lower half of the pipe. When necessary to prevent pipeline movement during testing, place additional backfill around pipe to prevent movement during testing, but leaving joints uncovered to permit inspection. When leakage or pressure drop exceeds the allowable amount specified, make satisfactory correction and retest pipeline section in the same manner. Correct visible leaks regardless of leakage test results.

2.3.6.4.8.5 Infiltration tests and ex-filtration tests: Perform these tests for sewer lines made of specified material, not only concrete, in accordance with ASTM C 969M, ASTM C 969. Make calculations in accordance with the Appendix to ASTM C 969M, ASTM 969.

2.3.6.4.8.6 Low-pressure air tests: Perform tests as follows: 1) Concrete pipe: Test in accordance with ASTM C 924M, ASTM C 924. Allowable pressure drop shall be given in ASTM C 924M ASTM C 924. Make calculations in accordance with the Appendix to ASTM C 924M, ASTM C 924; 2) Ductile-iron pipe: Test in accordance with the applicable requirements of ASTM C 924M, ASTM C 924. Allowable pressure drop shall be as given in ASTM C 924M, ASTM C 924. Make calculations in accordance with the Appendix to ASTM C 924M, ASTM C 924; 3) PVC Plastic pipe: Test in accordance with applicable requirements of UBPPA UNI-B-6. Allowable pressure drop shall be as given in UBPPA UNI-B-6. Make calculations in accordance with the Appendix to UBPPA UNI-B-6.

2.3.6.4.8.7 Deflection Testing

Deflection testing will not be required however, field quality control shall ensure that all piping is installed in accordance with deflection requirements established by the manufacturer.

2.3.6.4.8.8 Septic Systems

Septic systems if used shall be designed and installed in accordance with UFC 3-240-03.

2.4.6.5 Storm Sewer Systems

Storm sewer system shall not be mixed with sanitary sewer system and shall be in accordance with UFC 3-240-03.

3. GENERAL BUILDING REQUIREMENTS

3.1 Life Safety / Fire Protection / Handicapped Accessibility

To the extent possible, all facilities will be designed in accordance with recognized industry standards for life safety and building egress. In keeping with the intended function of these facilities, handicapped accessibility will not be incorporated into this project. Due to the war contingency requirement, it is assumed that only able-bodied military and civilian personnel will use the facilities listed herein.

3.2 Force Protection

Force protection/anti-terrorism measures for this location shall be followed and incorporated into this project in accordance with the referenced DOD Regulations. Information regarding force protection may be found at www.tisp.org/files/pdf/dodstandards.pdf.

4. ARCHITECTURAL

4.1 GENERAL

All material approved shall become standardized material to be used throughout the facilities under contract. Different sub-contractors shall not use different material or standards under the contract. Intent of the project is to use locally procured materials (unless specified otherwise) and labor to the maximum extent possible while satisfying seismic building code. Conflicts between criteria and local standards shall be brought to the attention of the Contracting Officer for resolution. In such instances, the Contractor shall furnish all available information with justification to the Contracting Officer.

4.2 DESIGN CRITERIA

The Codes, Standards, and Regulations listed below shall be used in the construction of this project. The publications shall be the most recent editions. Standards other than those mentioned may be accepted provided they meet the minimum requirements and the contractor shall submit proof of equivalency to the Contracting Officer for approval.

IBC- International Building Code

NFPA-101- National Fire Protection Association, Life Safety Code.

4.3 EXCAVATION

Trench excavation shall be made for concrete footings. Trenches shall be a minimum of .8 meter deep. Trenches deeper than 1.5 meters shall have protective shoring to protect workers or have the sides of the trench sloped back at a slope of 1.5:1. Care shall be taken when backfilling of foundation trenches to avoid damage to walls. Any excess dirt shall become the property of the Contractor and shall be removed from the site to a location approved by the Contracting Officer.

4.4 CONCRETE

Place 10cm (4") of capillary water barrier below areas to receive a concrete slab on properly compacted soil free of organic material. A plastic vapor barrier (10 mils thick) shall be placed over the crushed stone prior to placing of concrete slabs. Concrete flooring in wet areas shall slope to the floor drain and not allow for water to puddle. Concrete slabs in all areas shall not be placed prior to inspection and approval of piping and sub-surface by the Contracting Officer. Foundation trenches shall be level and free of loose material. Trenches shall be inspected and approved by the Contracting Officer prior to placing of any concrete foundations. See paragraph 5 for structural characteristics of concrete and reinforcing steel for foundations and slabs.

4.4.1 Insulated Concrete Sandwich Wall System

As an option to standard masonry construction, the Contractor can construct walls of single storey buildings using an insulated concrete sandwich wall system. The insulated concrete sandwich wall system shall be field fabricated and composed of a 76mm (3 inch) expanded polystyrene core that spans in a single piece from floor elevation to top of wall elevation. The polystyrene core shall have a welded wire fabric, 50mm x 50 mm (2 inch x 2 inch) mesh, 2.52mm (12.5 gauge) wire, attached to both faces of the polystyrene core. The welded wire mesh shall be installed at 12.7mm (1/2 inch) from the face of the polystyrene core. The welded wire mesh on each face shall be attached to each other and the polystyrene core with diagonal truss wires. Apply sprayed on concrete (shotcrete) to a minimum thickness of 38mm (1-1/2 inch) or as structural calculations require, whichever is greater. Method of placing the shotcrete shall be in conformance with ACI 506R-85. Concrete finishing shall be done by appropriate hand tools (darby, trowel, etc.) to provide the desired finish effect.

4.5 MASONRY

Storage of masonry materials shall be in a dry place or materials shall be covered with a plastic protective layer. Cover open walls each day to keep them protected and dry. Concrete masonry units (CMU) shall be either 100mm or 200mm wide x 400mm x 200mm high as shown on drawings. They shall be installed in running bond level and plumb. Mortar joints shall be 9mm on all sides between CMU. Joints shall be struck with a concave tool to provide a smooth recessed curved surface. Install only quality units. The surface shall be free of chips, cracks, or other imperfections that would detract from the overall appearance of the finished wall. Defective CMU or mortar shall be rejected.

4.6 METAL

4.6.1 Steel Roof Joists

Steel roof joists shall be placed according to the roof design and roof manufacturer specifications. Steel "Z" purlins shall be installed perpendicular to the steel beams. Use continuous metal roof sheets from ridge to eave to avoid constructing roof seams. In lieu of the continuous metal roof sheets, the Contractor can submit a plan for roofing seams; however, the plan must show a detail of how leaks will be avoided, and the Contracting Officer before application must approve the plan. Steel "hat channels" shall be installed on the bottom side of steel beams for the installation of gypsum board with screws. Provide all necessary metal framing for roof fascia and soffits. See structural paragraph for structural characteristics of steel joists.

4.6.2 Metal Window Sills

Galvanized metal window sills, 1mm (20 gage), shall be installed on the exterior of all windows. The metal window sills shall have a turn down of 5cm over the exterior masonry and stucco. Metal sills shall extend from side to side of the masonry opening in a single piece. Extend the metal windowsill a minimum of 2 cm under the bottom of the aluminum windows. Install masonry mortar as required for a smooth surface under the window sills. Sills shall slope a minimum of 6mm to the exterior and not allow water to puddle.

4.6.3 Steel Cook Top

Provide steel cook top in kitchen minimum thickness of 1cm. Provide circular cut outs. Consult with the Contracting Officer for the diameter of circular cutouts. Provide steel infill plates for all cut out openings. Cook top can be made of several pieces for ease of handling. Adjacent plates shall be tight fitting to each other.

4.6.4 Pass-Through Counter Top

Provide 1.6mm (16 gauge) stainless steel, or 4cm marble, pass through counter tops at openings between the kitchen and dining area. Edges shall be turned down 3 cm and corners shall be welded and ground smooth. Provide anchor angles welded to the bottom of the counters to anchor tops to masonry walls below. Provide six (6) anchors on the Dish Return Counter, three (3) on each side of the wall. Provide eight (8) anchors on the Serving Counter, four (4) on each side of the wall. Anchor angles to wall with masonry expansion sleeves and stainless steel screws. Counter tops are to be 60cm wide x length of opening shown.

4.7 CARPENTRY

4.7.1 Wood Purlins

If Contractor chooses to utilize wood purlins, provide and install roof purlins of natural wood, locally available material 1 meter on center securely wedged between steel H structural joists. Tightly fit 3cm boards over roof structure and nail into wood purlins. New roofing shall extend a minimum of 30cm past the exterior surface of the wall.

4.7.2 Wood Fascia & Soffit

If Contractor chooses to utilize wood fascia and soffit boards, provide and install 3cm fascia and soffit boards. Wood boards shall be planed and smooth ready for paint finish. Soffit shall extend 30cm out from exterior wall surface. Extend fascia board down past bottom of soffit a minimum of 6mm for water drip. Extend roof decking out over fascia a minimum of 2cm. Provide a 4cm drip flashing over edge of roof decking so that it extends past bottom of decking on all sides of the building. Provide continuous soffit venting of all overhangs at both bottom and top of roof slope.

4.7.3 Wood Battens

If Contractor chooses to utilize wood ceiling batten strips, wood ceiling batten strips, 2cm x 6cm, shall be nailed to the bottom of the wood purlins. Battens shall be spaced at 40cm on center (or per UBC requirements if sheetrock is substituted for plaster). This is for the support of a plaster ceiling.

4.8 ROOFING AND WEATHERPROOFING

4.8.1 Sloped Roofs

On sloping roofs provide and install .70mm (24 gauge) galvanized steel in either corrugated or standing seam design. Metal roofing shall be anchored to the steel "Z" purlins or wood deck sub-surface using exposed fasteners at 30cm on center at all seams and at 60cm on center in the panel field. Fasteners shall be placed at the top of the corrugation taking care not to dent panel. Roof sealant or adhesive shall be placed over each anchor head. Roofing system shall include all edge, ridge and penetration flashings necessary for a watertight installation and as described in 3.8.2 above. Roofing shall be galvanized mil finish. Panels shall be overlapped two corrugations side to side and be continuous sheets from ridge to eave. Provide continuous ridge vents on all gable roofs.

4.8.2 Flat Roofs

Provide and install 3 ply built up roofing over concrete deck. Contractor may propose to the Contracting Officer an alternate roofing system with justification for consideration and alternate pricing. Concrete roof deck shall slope 21mm per m.

4.8.2.1 Built-up Roofing System

A Insulated-Deck, Coal Tar, Glass-Fiber, Aggregate Roofing (ICGA-BUR): Provide built-up, aggregate-surfaced roof system with coal tar bitumen and glass-fiber ply felts (roof manufacturer's separation layers) for layup as indicated.

1. Primer: ASTM D 41 primer as recommended by roofing manufacturer.
2. Coal Tar Bitumen: ASTM D 450, Type III, as an option to asphalt.
3. Bitumen Membrane which meets the following:
 - a. ASTM D312 or the equivalent EN 1849-1 for thickness and unit weight,

- b. ASTM D312 or the equivalent EN-1426 for penetration,
- c. ASTM D312 or the equivalent EN-1427 for softening point
- d. ASTM D312 or the equivalent TS 11758-1 for flash point or heat stability
- e. ASTM D4601 or the equivalent TS 11758-1 for width and area of roll
- f. ASTM D4601 (moisture percentage) or the equivalent EN 1928 (water tightness)
- g. ASTM D226 (pliability) or the equivalent EN 1109 (cold bending).

4. Glass Roofing Felt: ASTM D 2178, Type IV or VI, except felts for coal tar systems shall be impregnated with a bituminous resin coating which is compatible with coal tar bitumen.

5. Organic Felt Base: ASTM D 2626 for use with asphalt roofing system.

6. Organic Felt Base: ASTM D 226 for use with asphalt roofing system and ASTM D 227 for use with coal tar roofing system. Organic felts may be used for bitumen stops and edge envelopes.

7. Insulation: 5cm (2 inch) thick extruded polystyrene rigid thermal insulation boards, conforming DIN, EN 13164 BS, EN 13164, $k=0.2$ @ 75 degrees F mean temperature, 2.82 kg/sq cm (40 lbs/sq in) compressive strength, hydrophobic, Type VI.

4.8.2.2 Roof Membrane Installation

A. Prime surface of concrete deck with asphalt primer per manufacturers recommended application rate.

B. Cant Strips/Tapered-Edge Strips: Wood, not less than 89mm (3-1/2 inches) high, 45-degree insulation cant strips at juncture of membrane with vertical surface. Provide tapered-edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

C. Base Layer: Install one lapped course of base sheet. Attach first layer of roofing membrane material to substrates and elsewhere as indicated. Mop to non-nailable substrate with hot bitumen or apply with torch method per manufacturer's specifications

D. Second Layer: Install second layer of roofing membrane material over the first course staggering joints and seams in both directions by at least 300mm. Mop top layer of membrane to base layer, or attach via torch method per manufacturer's specifications.

4.8.2.3 Insulation Installation

Comply with insulation manufacturer's instructions and recommendations for handling, installing, and bonding or anchoring insulation to substrate. Insulation boards shall be installed loose, without glue, in staggered manner. Attention should be paid not to leave separation along edges. Where overall insulation thickness is 50 mm (2 inches) or greater, install required thickness in two layers with joints of second layer offset from joints of first layer a minimum of 300 mm (12 inches) each direction. Trim surface of insulation where necessary at roof drains so completed surface is flush with drain ring. Polyester felt or geotextile shall be installed over insulation layers as a filter layer to prevent the passage of fines in gravel layer to lower strata.

4.8.2.4 Composition Flashing And Stripping

A. Install composition flashing at cant strips, at other sloping and vertical surfaces, at roof edges, and at penetrations through roof. Install composition flashing in accordance with membrane manufacturers specifications. Nail or provide other forms of mechanical anchorage of composition flashing to vertical surfaces as recommended by manufacturer of primary roofing materials.

B. Install composition stripping where metal flanges are set on roofing. Provide not less than two plies of woven glass-fiber fabric, each set in a continuous coating of roofing cement and extended onto the deck 100 mm to 150 mm

(4 inches and 6 inches), respectively. Except where concealed by aggregate surfacing or elastic flashing, apply a heavy coating of roofing cement over composition stripping.

C. Roof Drains: Fill clamping ring base with a heavy coating of roofing cement. Set built up roofing membrane in to the clamping ring base and fix the drain top on it.

D. Allow for expansion of running metal flashing and edge trim that adjoins roofing. Do not seal or bond built-up roof membrane or composition flashing and stripping to metal flanges that are over 914mm (3 feet) in length.

E. Counterflashings: Counterflashings, cap flashings, expansion joints and similar work to be coordinated with built-up roofing work, are specified in other sections of these specifications.

F. Roof Accessories: Miscellaneous sheet metal accessory items, including insulation vents and other devices and major items of roof accessories to be coordinated with built-up roofing work.

4.8.2.5 Gravel Layer

A gravel layer of 16 to 32mm diameter stone will be laid in at least 5cm thick on top of the filter layer in non-trafficable flat roofs. The gravel layer will be applied as soon as possible to prevent UV damage and/or wind damage to insulation and filter layers.

4.8.3 Flashing and Sheet Metal

4.8.3.1 Materials

Any metal listed by ASTM, DIN, BS or EN standards. Manual for a particular item may be used, unless otherwise specified or indicated. Materials shall conform to the requirements specified below and to the thicknesses and configurations established in ASTM, DIN, BS or EN standards. Different items need not be of the same metal, except that if copper is selected for any exposed item, all exposed items shall be copper.

4.8.3.2 Steel Sheet, Zinc-Coated (Galvanized)

Zinc coated steel conforming to ASTM A 525, DIN BS or EN Standards.

4.8.3.3 Aluminum wall capping and expansion joint profiles.

Aluminum wall capping conforming to ASTM B 209 M, DIN 18339, BS or EN Standards.

4.8.3.4 General

Downspouts shall be designed and fabricated on site. Unless otherwise specified or indicated, exposed edges shall be folded back to form a 13 mm (1/2 inch) hem on the concealed side, and bottom edges of exposed vertical surfaces shall be angled to form drips. Bituminous cement shall not be placed in contact with roofing membranes other than built-up roofing.

4.8.3.5 Wall, Floor, Ceiling Expansion Joints Over Plaster

Expansion joints shall be provided as specified in ASTM, DIN 18339, BS or EN Standards.

4.8.3.6 Connections and Jointing

4.8.3.6.1 Soldering

Soldering shall apply to copper, and stainless steel items. Edges of sheet metal shall be pre-tinned before soldering is begun. Soldering shall be done slowly with well heated soldering irons so as to thoroughly heat the seams and completely sweat the solder through the full width of the seam. Edges of stainless

steel to be pre-tinned shall be treated with soldering acid flux. Soldering shall follow immediately after application of the flux. Upon completion of soldering, the acid flux residue shall be thoroughly cleaned from the sheet metal with a water solution of washing soda and rinsed with clean water.

4.8.3.6.2 Seaming

Flat-lock and soldered-lap seams shall finish not less than 25 mm. wide. Unsoldered plain-lap seams shall lap not less than 75 mm. unless otherwise specified. Flat seams shall be made in the direction of the flow.

4.8.3.7 Cleats

A continuous cleat shall be provided where indicated or specified to secure loose edges of the sheet metalwork. Butt joints of cleats shall be spaced approximately 3 mm. apart. The cleat shall be fastened to supporting wood construction with nails evenly spaced not over 300 mm. on centers. Where the fastening is to be made to concrete or masonry, screws shall be used and shall be driven in expansion shields set in concrete or masonry.

4.8.3.8 Downspouts

Downspouts shall be installed as indicated. Downspouts shall be rigidly attached to the building. Supports for downspouts shall be spaced according to manufacturer's recommendations.

4.8.3.9 Flashing

Flashing shall be installed at locations indicated and as specified below. Sealing shall be according to the flashing manufacturer's recommendations. Flashings shall be installed at intersections of roof with vertical surfaces and at projections through roof, except that flashing for heating and plumbing, including piping, roof and floor drains, and for electrical conduit projections through roof or walls are specified in other sections. Except as otherwise indicated, counter flashings shall be provided over base flashings. Perforations in flashings made by masonry anchors shall be installed on top of joint reinforcement. Lashing shall be formed to direct water to the outside of the system.

4.8.3.9.1 Through-wall Flashing

Through-wall flashing includes sill, lintel, and spandrel flashing. The flashing shall be laid with a layer of mortar above and below the flashing so that the total thickness of the two layers of the mortar and flashing are the same thickness as the regular mortar joints. Flashing shall not extend further in to the masonry backup wall than the first mortar joint. Joints in flashing shall be lapped and sealed. Flashing shall be one piece for lintels and sills.

4.8.3.9.2 Lintel Flashing

Lintel flashing shall extend the full length of lintel. Flashing shall extend through the wall one masonry course above the lintels and shall be bent down over the vertical leg of the outer steel lintel angle not less than 50 mm, or shall be applied over top of masonry and pre-cast concrete lintels. Bed joints of lintels at joints shall be under laid with sheet metal bond breaker.

4.8.3.9.3 Sill Flashing

Sill flashing shall extend the full width of the sill and not less than 100 mm beyond ends of sill except at joint where the flashing shall be terminated at the end of the sill.

4.8.3.10 Wall Capping

Wall Capping shall be installed according to the manufacturer's recommendations.

4.8.4 Sealants

4.8.4.1 Interior Sealant

ASTM C 834 or ASTM C 920, Type S or M, Grade NS, Class 12.5, Use NT, DIN, BS, or EN equal standards.

4.8.4.2 Exterior Sealant

For joints in vertical and horizontal surfaces, provide ASTM C 920, Type S or M, Grade NS, DIN, BS, or EN equal standards.

4.8.4.3. Floor Joint Sealant

(ASTM C 920) Type S or M, Grade P, class 25, use T

4.8.4.4 Primers

Provide a non-staining, quick-drying type and consistency recommended by the sealant manufacturer for the particular application.

4.8.4.5 Bond Breakers

Provide the type and consistency recommended by the sealant manufacturer to prevent adhesion of the sealant to backing or to bottom of the joint.

4.8.4.6 Backstops

Backing shall be 25 to 33 percent oversize for closed cell and 40 to 50 percent oversize for open cell material, unless otherwise indicated.

4.8.4.7 Cleaning Solvents

Provide type(s) recommended by the sealant manufacturer except for aluminum and bronze surfaces that will be in contact with sealant.

4.8.4.8 Surface Preparation

Surfaces shall be clean, dry to the touch, and free from dirt frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter that would tend to destroy or impair adhesion. Oil and grease shall be removed with solvent and surfaces shall be wiped dry with clean cloths. When resealing an existing joint, remove existing calk or sealant prior to applying new sealant. For surface types not listed below, the sealant manufacturer shall be contacted for specific recommendations.

4.8.4.9 Masking Tape

Masking tape shall be placed on the finish surface on one or both sides of a joint cavity to protect adjacent finish surfaces from primer or sealant smears. Masking tape shall be removed within 10 minutes after joint has been filled and tooled.

4.8.4.10 Backstops

Install backstops dry and free of tears or holes. Tightly pack the back or bottom of joint cavities with backstop material to provide a joint of the depth specified.

4.8.4.11 Primer

Immediately prior to application of the sealant, clean out loose particles from joints. Where recommended by sealant manufacturer, apply primer to joints in concrete masonry units, wood, and other porous surfaces in accordance with sealant manufacturer's instructions. Do not apply primer to exposed finish surfaces.

4.8.4.12 Bond Breaker

Provide bond breakers to the back or bottom of joint cavities, as recommended by the sealant manufacturer for each type of joint and sealant used, to prevent sealant from adhering to these surfaces. Carefully apply the bond breaker to avoid contamination of adjoining surfaces or breaking bond with surfaces other than those covered by the bond breaker.

4.8.4.13 Sealants

Provide a sealant compatible with the material(s) to which it is applied. Do not use a sealant that has exceeded shelf life or has jelled and can not be discharged in a continuous flow from the gun. Apply the sealant in accordance with the manufacturer's instructions with a gun having a nozzle that fits the joint width. Force sealant into joints to fill the joints solidly without air pockets. Tool sealant after application to ensure adhesion. Sealant shall be uniformly smooth and free of wrinkles. Upon completion of sealant application, roughen partially filled or unfilled joints, apply sealant, and tool smooth as specified. Sealer shall be applied over the sealant when and as specified by the sealant manufacturer.

4.8.4.14 Protection

Protect areas adjacent to joints from sealant smears. Masking tape may be used for this purpose if removed 5 to 10 minutes after the joint is filled.

4.8.4.15 Final Cleaning

Upon completion of sealant application, remove remaining smears and stains and leave the work in a clean and neat condition.

a. Masonry and Other Porous Surfaces: Immediately scrape off fresh sealant that has been smeared on masonry and rub clean with a solvent as recommended by the sealant manufacturer. Allow excess sealant to cure for 24 hour then remove by wire brushing or sanding.

b. Metal and Other Non-Porous Surfaces: Remove excess sealant with a solvent-moistened cloth.

4.9 WINDOWS, DOORS & GLAZING

4.9.1 Windows

4.9.1.1 Materials

A. Aluminum Extrusions: Provide alloy and temper recommended by the window manufacturer for the strength, corrosion resistance, and application of required finish, meeting the DIN 1725 raw material requirements, but not less than 215 N/mm² ultimate tensile strength and not less than 1.5 mm thick at any location for main frame and sash members.

B. Fasteners: Provide aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by the manufacturer to be non-corrosive and compatible with aluminum window members, trim, hardware, anchors, and other components of window units.

1. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125 inch thick, reinforce the interior with aluminum or nonmagnetic stainless steel to receive screw threads or provide standard non-corrosive pressed-in splined grommet nuts.

2. Exposed Fasteners: Except where unavoidable for application of hardware, do not use exposed fasteners. For application of hardware, use fasteners that match the finish of the member or hardware being fastened, as appropriate.

C. Anchors, Clips, and Window Accessories: Fabricate anchors, clips, and window accessories of aluminum, nonmagnetic stainless steel, or hot-dip zinc-coated steel or iron complying with the requirements of DIN 1748; provide sufficient strength to withstand design pressure indicated. As a minimum provide 3 anchors on each side of the frame.

D. Compression-Type Glazing Strips and Weatherstripping: Unless otherwise indicated, and at the manufacturer's option, provide compressible stripping for glazing and weatherstripping such as molded EPDM or neoprene gaskets.

E. Sealant: For sealants required within fabricated window units, provide type recommended by the manufacturer for joint size and movement. Sealant shall remain permanently elastic non-shrinking, and non-migrating. Comply with Sealants of these specifications for selection and installation of sealants.

F. Wire Fabric Insect Screen shall be permanently fixed to the exterior.

4.9.1.2 Hardware

A. General: Provide the manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum and of sufficient strength to perform the function for which it is intended.

4.9.1.3 Horizontal Sliding Windows

Provide window units with 5 mm single glazed. Provide cam action sweep sash lock and keeper at meeting rails.

4.9.1.4 Fabrication

Provide horizontally sliding aluminum windows with factory finish in all buildings to fit the masonry openings. Window openings shall be provided with insect screening permanently fixed to the exterior. Provide a locking device on the interior of each window. Provide anchors on each side of the frame into the adjoining masonry, 3 on each side. Provide weather stripping system for all exterior windows and doors.

4.9.1.5 Finishes

Apply baked enamel in compliance with paint manufacturer's specifications for cleaning, conversion coating, and painting.

1 Color: White meeting the requirements of DIN 50018

4.9.1.6 Inspection

Inspect openings before beginning installation. Verify that rough or masonry opening is correct and the sill plate is level. Masonry surfaces shall be visibly dry and free of excess mortar, sand, and other construction debris.

4.9.1.7 Installation

Comply with manufacturer's specifications and recommendations for installation of window units, hardware, operators, and other components of the work. Set window units plumb, level, and true to line, without warp or rack of frames or sash. Provide proper support and anchor securely in place. Set sill members and other members in a bed of compound or with joint fillers or gaskets, as shown, to provide weathertight construction. Refer to the Sealant sections for compounds, fillers, and gaskets to be installed concurrently with window units. Coordinate installation with wall flashings and other components of the work.

4.9.1.8 Adjusting

Adjust operating sash and hardware to provide a tight fit at contact points and at weatherstripping for smooth operation and a weathertight closure.

4.9.1.9 Cleaning

Clean aluminum surfaces promptly after installation of windows. Exercise care to avoid damage to protective coatings and finishes. Remove excess glazing and sealant compounds, dirt, and other substances. Lubricate hardware and other moving parts.

4.9.2 Doors

Generally, doors shall be wood, flush solid core, 90cm wide x 203cm high x 45mm thick with wood frames to match new door masonry openings. All glazed doors shall have 5mm single glazing in the upper half of the door. Heavy gauge metal exterior doors are required for security of unmanned buildings, such as water treatment building, power station, warehouses, and other buildings requiring higher security. Commercial duty lock sets and hardware shall be used on all doors. Install required louvers, as called for in paragraph 6, in the lower portion of the door. Provide 3 hinges on all doors. Provide door handles and locksets that can be locked with a key on all doors. All door locks shall have a thumb latch on inside of door such that no key is necessary to exit a building. Coordinate the final keying schedule with Contracting Officer prior to ordering lock sets. Generally each building should have 8 master keys fitting all locks, 8 sub-master keys fitting all exterior doors and 3 keys each for each interior door. Include 25% spare key blanks for the amount of keys provided per building. Provide numbering system identifying key to associated room door. All glazing in or adjacent to doors shall be tempered per IBC. Provide weather stripping system for all exterior doors.

4.9.2.1 Steel Doors

SDI A250.8, except as specified otherwise. Prepare doors to receive specified hardware. Undercut where indicated. Exterior doors shall have top edge closed flush and sealed to prevent water intrusion. Doors shall be 44.5 mm thick, unless otherwise indicated. Doors shall be constructed using heavy gauge steel with minimum thickness of 1.2 mm.

4.9.2.1.1 Accessories

4.9.2.1.1.1 Louvers

4.9.2.1.1.1 Interior Louvers

SDI 111-C, Louvers shall be stationary sightproof or lightproof type as required. Louvers for lightproof doors shall not transmit light. Detachable moldings on room or non security side of door; on security side of door, moldings to be integral part of louver. Form louver frames of 0.9 mm thick steel and louver blades of a minimum 0.6 mm. Louvers for lightproof doors shall have minimum of 20 percent net-free opening. Sightproof louvers to be inverted "V" blade design with minimum 55 or inverted "Y" blade design with minimum 40 percent net-free opening.

4.9.2.1.1.2 Exterior Louvers

Louvers shall be inverted "Y", "V" or "Z" type. Weld or tenon louver blades to continuous channel frame and weld assembly to door to form watertight assembly. Form louvers of hot-dip galvanized steel of same gage as door facings. Louvers shall have steel-framed insect screens secured to room side and readily removable. Provide aluminum wire cloth, 7 by 7 per 10 mm or 7 by 6 per 10 mm mesh, for insect screens.

4.9.2.1.1.3 Astragals

For pairs of exterior steel doors which will not have aluminum astragals or removable mullions, provide overlapping steel astragals with the doors. For interior pairs of fire rated and smoke control doors, provide stainless steel astragals complying with NFPA 80 for fire rated assemblies and NFPA 105 for smoke control assemblies.

4.9.2.1.1.4 Moldings

Provide moldings around glass of interior and exterior doors of interior doors. Provide non-removable moldings on outside of exterior doors and on corridor side of interior doors. Other moldings may be stationary or removable. Secure inside moldings to stationary moldings, or provide snap-on moldings. Muntins shall interlock at intersections and shall be fitted and welded to stationary moldings.

4.9.2.1.2 Standard Steel Frames

SDI A250.8, except as otherwise specified. Form frames to sizes and shapes indicated, with welded corners or knock-down field-assembled corners. Provide steel frames for doors, transoms, sidelights, mullions, cased openings, and interior glazed panels, unless otherwise indicated.

4.9.2.1.3 Welded Frames

Continuously weld frame faces at corner joints. Mechanically interlock or continuously weld stops and rabbets. Grind welds smooth.

4.9.2.1.4 Mullions and Transom Bars

Mullions and transom bars shall be closed or tubular construction and shall member with heads and jambs butt-welded thereto or knock-down for field assembly. Bottom of door mullions shall have adjustable floor anchors and spreader connections.

4.9.2.1.5 Stops and Beads

Form stops and beads from 0.9 mm thick steel. Provide for glazed and other openings in standard steel frames. Secure beads to frames with oval-head, countersunk Phillips self-tapping sheet metal screws or concealed clips and fasteners. Space fasteners approximately 300 to 400 mm on centers. Miter molded shapes at corners. Butt or miter square or rectangular beads at corners.

4.9.2.1.6 Anchors

Provide anchors to secure the frame to adjoining construction. Provide steel anchors, zinc-coated or painted with rust-inhibitive paint, anchors not lighter than 1.2 mm thick.

4.9.2.1.6.1 Wall Anchors

Provide at least three anchors for each jamb. For frames which are more than 2285 mm in height, provide one additional anchor for each jamb for each additional 760 mm or fraction thereof.

- a. Masonry: Provide anchors of corrugated or perforated steel straps or 5 mm diameter steel wire, adjustable or T-shaped;
- b. Completed openings: Secure frames to previously placed concrete or masonry with expansion bolts

4.9.2.1.6.2 Floor Anchors

Provide floor anchors drilled for 10 mm anchor bolts at bottom of each jamb member. [Where floor fill occurs, terminate bottom of frames at the indicated finished floor levels and support by adjustable extension clips resting on and anchored to the structural slabs.]

4.9.2.1.7 Fire and Smoke Doors and Frames

NFPA 80 and NFPA 105 respectfully and this specification. The requirements of NFPA 80 and NFPA 105 respectfully shall take precedence over details indicated or specified.

4.9.2.1.8 Weatherstripping, Integral Gasket

Black synthetic rubber gasket with tabs for factory fitting into factory slotted frames, or extruded neoprene foam gasket made to fit into a continuous groove formed in the frame, may be provided in lieu of head and jamb seals. Insert gasket in groove after frame is finish painted.

4.9.2.1.9 Hardware Preparation

Provide minimum hardware reinforcing gages as specified in ANSI A250.6. Drill and tap doors and frames to receive finish hardware. Prepare doors and frames for hardware in accordance with the applicable requirements of SDI A250.8 and ANSI A250.6. For additional requirements refer to BHMA A115. Drill and tap for surface-applied hardware at the project site. Build additional reinforcing for surface-applied hardware into the door at the factory. Locate hardware in accordance with the requirements of SDI A250.8, as applicable. Punch door frames, with the exception of frames that will have weatherstripping or lightproof or soundproof gasketing, to receive a minimum of two rubber or vinyl door silencers on lock side of single doors and one silencer for each leaf at heads of double doors. Set lock strikes out to provide clearance for silencers.

4.9.2.1.10 Finishes

All surfaces of doors and frames shall be thoroughly cleaned, chemically treated and factory primed with a rust inhibiting coating as specified in SDI A250.8, or paintable A25 galvanized steel without primer. Where coating is removed by welding, apply touchup of factory primer.

4.9.2.1.11 Fabrication and Workmanship

Finished doors and frames shall be strong and rigid, neat in appearance, and free from defects, waves, scratches, cuts, dents, ridges, holes, warp, and buckle. Molded members shall be clean cut, straight, and true, with joints coped or mitered, well formed, and in true alignment. Dress exposed welded and soldered joints smooth. Design door frame sections for use with the wall construction indicated. Corner joints shall be well formed and in true alignment. Conceal fastenings where practicable. On wraparound frames for masonry partitions, provide a throat opening 3 mm larger than the actual masonry thickness. Design other frames in exposed masonry walls or partitions to allow sufficient space between the inside back of trim and masonry to receive calking compound.

4.9.2.1.11.2 Grouted Frames

For frames to be installed in exterior walls and to be filled with mortar or grout, fill the stops with strips of rigid insulation to keep the grout out of the stops and to facilitate installation of stop-applied head and jamb seals.

4.9.2.1.12 Installation

4.9.2.1.12.1 Frames

Set frames in accordance with SDI 105. Plumb, align, and brace securely until permanent anchors are set. Anchor bottoms of frames with expansion bolts or powder-actuated fasteners. Build in or secure wall anchors to adjoining construction. Backfill frames with mortar. When an additive is provided in the mortar, coat inside of frames with corrosion-inhibiting bituminous material. For frames in exterior walls, ensure that stops are filled with rigid insulation before grout is placed.

4.9.2.1.12.2 Doors

Hang doors in accordance with clearances specified in SDI A250.8. After erection and glazing, clean and adjust hardware.

4.9.2.1.12.3 Fire and Smoke Doors and Frames

Install fire doors and frames, including hardware, in accordance with NFPA 80.

4.9.2.1.13 Protection and Cleaning

Protect doors and frames from damage. Repair damaged doors and frames prior to completion and acceptance of the project or replace with new, as directed. Wire brush rusted frames until rust is removed. Clean thoroughly. Apply an all-over coat of rust-inhibitive paint of the same type used for shop coat. Upon completion, clean exposed surfaces of doors and frames thoroughly. Remove mastic smears and other unsightly marks.

4.9.2.2 Wood Doors

Provide doors that are wood, solid core, 90/100/110/120 cm. Wide x 220 cm. High x 45 mm. Thick with steel frame to match new door masonry openings. All glazed doors shall have 5 mm. single tempered glazing

4.9.2.2.1 Accessories

4.9.2.2.1.1 Door Louvers

Fabricate from wood and of sizes indicated. Louvers shall be of the manufacturer's standard design and shall transmit a minimum of 35 percent free air. Louvers shall be the slat type.

4.9.2.2.1.2 Door Light Openings

Provide glazed openings with the manufacturer's standard wood moldings except that moldings for doors to receive natural finish shall be of the same species and color as the face veneers. Moldings for flush doors shall be lip type.

4.9.2.2.1.3 Weather stripping

Provide weathers tripping that is a standard cataloged product of a manufacturer regularly engaged in the manufacture of this specialized item. Weather stripping shall be looped neoprene or vinyl held in an extruded non-ferrous metal housing. Air leakage of weather stripped doors shall not exceed 0.003125 cubic meter per second of air per square meter of door area when tested in accordance with ASTM E 283

4.9.2.2.1.4 Prefitting

At the Contractor's option, doors may be provided factory pre-fit. Doors shall be sized and machined at the factory by the door manufacturer in accordance with the standards under which they are produced. The work shall include sizing, beveled edges, mortising, and drilling for hardware and providing necessary beaded openings for glass and louvers. Provide the door manufacturer with the necessary hardware samples, and frame and hardware schedules as required to coordinate the work.

4.9.2.2.1.5 Finishes

Provide door finish colors as selected by the Contracting Officer from the color selection samples.

4.9.2.2.1.6 Water-Resistant Sealer

Provide a water-resistant sealer compatible with the specified finish as approved and as recommended by the door manufacturer.

4.9.2.2.1.7 Installation

Before installation, seal top and bottom edges of doors with the approved water-resistant sealer. Seal cuts made on the job immediately after cutting using approved water-resistant sealer. Fit, trim, and hang doors with a 2 mm minimum, 3 mm maximum clearance at sides and top, and a 5 mm minimum, 6 mm maximum clearance over thresholds. Provide 10 mm minimum, 11 mm maximum clearance at bottom where no threshold occurs. Bevel edges of doors at the rate of 3 mm in 50 mm. Door warp shall not exceed 6 mm when measured in accordance with WDMA I.S. 1-A.

4.9.2.2.1.8 Weather stripping

Install doors in strict accordance with the manufacturer's printed instructions and details. Weather strip exterior swing-type doors at sills, heads and jambs to provide weather tight installation. Apply weather stripping at sills to bottom rails of doors and hold in place with a brass or bronze plate. Apply weather stripping to door frames at jambs and head. Shape weather stripping at sills to suit the threshold.

4.9.2.3 Overhead Coiling Doors

Doors shall be fabricated from interlocking cold-rolled slats, designed to withstand building wind loading and be installed with wind locks. Slat shall be continuous for the width of the door. For doors not exceeding 4.27 m, slats shall be flat-profile design, with a depth of not less than 15.9 mm, a center to center width not more than 69.9mm, and not less than a 1.21mm uncoated thickness. Provide weather stripping for door-head and door jamb guides, and a bottom astragal. Weather stripping and astragal shall be natural rubber or neoprene rubber. Curtain jamb guides shall be fabricated from a combination of steel angles of sufficient size to retain curtain against the specified wind. Guides shall be fabricated from structural quality steel angles. Door shall have manufacturer's standard five pin tumbler locks; keyed. Doors shall be counterbalanced by an adjustable, steel, helical torsion spring mounted around a steel shaft in a spring barrel and connected to the door curtain with the required barrel rings. Hoods shall be fabricated from steel sheets with a minimum yield strength of 227.5 Mpasc.

Counterbalance-barrel components shall be as follows:

- Spring barrels shall be hot-formed structural-quality carbon steel, welded or seamless pipe. Pipe shall be of sufficient diameter and wall thickness to limit deflection to a maximum of 1/360 of the span.
- Counterbalance springs shall be oil-tempered helical steel springs designed with a safety factor of 4. Springs shall be sized to counterbalance the weight of the curtain at any point of its travel, and shall be capable of being adjusted to counterbalance not less than 125% of the normal curtain load. Spring adjustment shall be arranged in such a way that the curtain need not be raised or lowered to secure the adjustment.
- Counterbalance shafts shall be case-hardened steel of the proper size to hold the fixed ends of the spring and carry the torsional load of the spring.

Barrel plugs shall be fabricated from cast steel machined to fit the ends of the barrel. Plugs shall secure the ends of the spring to the barrel and the shaft.

Barrel rings shall be fabricated from malleable iron of the proper involute shape to coil the curtain in a uniformly increasing diameter.

Shaft bearings shall be factory sealed ball bearings of the proper size for load and shaft diameters.

Door operators shall consist of an endless steel hand chain, chain-pocket wheel and guard, and a geared reduction unit of at least a 3:1 ratio. Required pull for operation shall not exceed 16 kg. Chain hoists shall have a self-locking mechanism allowing the curtain to be stopped at any point in its upward/downward travel and to remain in that position until moved to the fully open or closed position. Hand chains shall be cadmium-plated alloy steel with a yield point of at least three times the required hand-chain pull.

Pretreated zinc-coated steel sheets shall be given the manufacturer's standard prime coat and an enamel finish coat applied to the exterior face after forming.

After installation, doors, track, and operating equipment will be examined and tested for general operation and weather against the specified wind pressure, and weather resistance. Doors that fail the required tests shall be adjusted and retested. Doors that have been adjusted and fail subsequent tests shall be removed and replaced with new doors at no additional cost.

4.9.3 Glazing

ASTM C 1036, or ASTM C 1172 or equal. Acceptable manufacturer : Gürsan or equal

4.9.3.1 Tempered Glass

Tempered glass shall be kind FT fully tempered flat type. Class 1 clear, condition A uncoated surface, Quality q3-glazing select, conforming to ASTM, DIN, BS or EN standards. Color shall be clear.

4.9.3.2 Glazing Accessories

4.9.3.2.1 Sealant

Sealant shall be elastomeric conforming to ASTM, DIN, BS, or EN standards. Type S or M, Grade NS, Class 12.5, Use G, of type chemically compatible with setting blocks, preformed sealing tape and sealants used in manufacturing insulation glass. Color of sealant shall be as selected from manufacturer's full range of standard colors by Contracting Officer.

4.9.3.2.2 Glazing Gaskets

Glazing gaskets shall be extruded with continuous integral locking projection designed to engage into metal glass holding members to provide a watertight seal during dynamic loading, building movements and thermal movements. Glazing gaskets for a single glazed opening shall be continuous one-piece units with factory-fabricated injection-molded corners free of flashing and burrs. Glazing gaskets shall be in lengths or units recommended by manufacturer to ensure against pull-back at corners.

4.9.3.2.3 Fixed Glazing Gaskets

Fixed glazing gaskets shall be closed-cell (sponge) smooth extruded compression gaskets of cured elastomeric virgin neoprene compounds conforming to ASTM, DIN, BS. Or EN standarts.

4.9.3.2.4 Wedge Glazing Gaskets

Wedge glazing gaskets shall be high-quality extrusions of cured elastomeric virgin neoprene compounds, ozone resistant, conforming to ASTM, DIN, BS, or EN standards.

4.9.3.2.5 Putty and glazing Compound

Glazing compound shall conform to ASTM, DIN, BS, or EN standards for face-glazing metal sash. Putty shall be linseed oil type conforming to DIN, BS, or EN standards for face-glazing primed wood sash. Putty and glazing compounds shall not be used with insulating glass or laminated glass.

4.9.3.2.6 Setting and Edge Blocking

Neoprene setting blocks shall be dense extruded type conforming to ASTM, DIN, BS, or EN standards. Silicone setting blocks shall be required when blocks are in contact with silicone sealant. Profiles, lengths and locations shall be as required and recommended in writing by glass manufacturer.

4.9.3.3 Preparation

Openings and framing systems scheduled to receive glass shall be examined for compliance with glass manufacturer's recommendations including size, squareness, offsets at corners, presence and function of weep system, face and edge clearance requirements and effective sealing between joints of glass-framing members. Detrimental materials shall be removed from glazing rabbet and glass surfaced and wiped dry with solvent. Glazing surfaces shall be dry and free of frost.

4.9.3.4 Installation

Glass and glazing work shall be performed in accordance with, glass manufacturer's instructions and warranty requirements. Glass shall be installed with factory labels intact and removed only when instructed. Edges and corners shall not be ground, nipped or cut after leaving factory. Springing, forcing or twisting of units during installation will not be permitted.

4.9.3.5 Cleaning

Upon completion of project, outside surfaces of glass shall be washed clean and the inside surfaces of glass shall be washed and polished in accordance with glass manufacturer's recommendations.

4.9.3.6 Protection

Glass work shall be protected immediately after installation. Glazed openings shall be identified with suitable warning tapes, cloth, or paper flags, attached with non-staining adhesives. Reflective glass shall be protected with a protective material to eliminate any contamination of the reflective coating. Protective material shall be placed far enough away from the coated glass to allow air to circulate to reduce heat buildup and moisture accumulation on the glass. Glass units which are broken, chipped, cracked, abraded, or otherwise damaged during construction activities shall be removed and replaced with new units.

4.10 FINISHES

All finishes, colors and materials in existing building and new buildings shall match. See Section 01335 for color submittals required. Provide color boards with all materials for COR approval prior to ordering materials.

4.10.1 The exterior of all buildings shall be stucco. A temperature of between 4 and 27 degrees C shall exist for a period of not less than 48 hours prior to application of plaster and for a period of at least 48 hours after plaster has set. Control joints shall be designed for expansion and contraction of plaster work due to thermal exposure. Control joints shall comprise of back to back casing beads. Install new stucco in 2 coats. The first coat shall be a scratch coat approximately 1 cm thick. Allow 7 days to cure. The second coat shall be finish stucco, smooth finish, approximately 1 cm thick. Allow 7 days to cure before painting. Stucco showing oversanding, cracks, blisters, pits, checks, discoloration or other defects is not acceptable. Defective plaster work shall be removed and replaced with new plaster at the expense of the Contractor. Patching of defective work will be permitted only when approved by the Contracting Officer. Patching shall match existing work in texture and color. Paint shall designated for exterior use, with less than .06% lead by weight. Stucco shall be painted with one coat of primer and two coats of finish paint, color to be selected by the Contracting Officer from the color board provided by the Contractor.

4.10.2 Interior walls shall be plaster applied in a similar manner as exterior stucco. Paint with 2 coats of semi-gloss off-white with less than .06% lead by weight color to be selected by the Contracting Officer from the color board provided by the Contractor.

4.10.3 Ceilings of Barracks, and Headquarters, shall be plaster applied in 2 coats over wire mesh, which is to be stapled to the 2cm x 6cm wood battens. Paint ceiling with 2 coats of flat white, with less than .06% lead by weight. Gypsum board may be used in lieu of plaster but framing supports for Gypsum board shall be as follows: For ½" thick gypsum board structural fastener supports shall be not further apart than 40 cm. If gypsum board is thicker follow guidelines in ASTM C 840 for supports and fastener frequency

4.10.4 Ceilings of Dining Facility shall be exposed concrete painted with 2 coats of flat white, with less than .06%

lead by weight.

4.10.5 Paint all exposed wood fascia, soffit, and doors with 2 coats of gloss enamel, white.

4.10.6 Exposed exterior steel trim, frames, doors and pipe railings: Paint with one coat oil-based primer, with 2 coats of oil-based alkyd gloss enamel, color to be selected by the Contracting Officer from the color board provided by the Contractor.

4.10.7 Exposed wood trim, frames and doors: Paint with one coat oil-based primer, 2 coats of gloss enamel, color to be selected by the Contracting Officer from the color board provided by the Contractor

4.10.8 Tile: Tile work shall not be performed unless the substrate and ambient temperature is at least 10 degrees C and rising. Temperature shall be maintained above 10 degrees C while the work is being performed and for at least 7 days after completion of work. Upon completion, tile surfaces shall be thoroughly cleaned in accordance with manufacturer's approved cleaning instructions. Acid shall not be used for cleaning glazed tile. Floor tile with resinous grout or with factory mixed grout shall be cleaned in accordance with instructions of the grout manufacturer. After the grout has set, tile wall surfaces shall be given a protective coat of a non-corrosive soap or other approved method of protection.

4.10.8.1 Floors in wet areas shall be 30cm x 30cm terrazzo tile with thin set mortar. Joints shall be 2-3mm. Waterproof gray grout shall be applied the full depth of the tile. Floors shall slope, minimum 1/50, to floor drains. Slope shall be obtained with sloping mortar bed of minimum 2cm thickness. Provide continuous waterproofing membrane beneath sloping mortar bed, turn up wall 30cm behind wall base. Membrane shall be fully sealed at joints and shall shed water into body of floor drain. Color of tile shall be selected by the Contracting Officer from samples provided by the Contractor.

4.10.8.2 Floors in administration areas/living quarters and corridors shall be 30cm x 30cm terrazzo tile with thin set mortar. Joints shall be 2-3mm. Waterproof gray grout shall be applied the full depth of the tile. Color of tile shall be selected by the Contracting Officer from samples provided by the Contractor.

4.10.8.3 Walls in wet areas shall be tiled with 150mm x 150mm glazed ceramic tile up to 2 meters above the floor to include interior of toilet stalls, showers and behind sinks. Joints shall be 2-3mm. Waterproof gray grout shall be applied full depth of the tile. Grout shall cure for 72 hours and then be sealed with a commercial grout sealant in two coats. Color of tile shall be selected by the Contracting Officer from samples provided by the Contractor.

4.10.9 The ablution drain areas shall be recessed below the floor level 20cm and lined with ceramic tile. Ceramic tile shall extend up the wall past the water spigots to a height of 2m above finished floor. Seats shall be formed concrete with terrazzo tile finish to match the floor, 30cm x 30cm x 30cm high finished dimensions. Color of ceramic tile shall be selected by the Contracting Officer from samples provided by the Contractor. Spacing between tiles shall be similar to terrazzo tile.

4.10.10 All other floors are to be completely cleaned and painted with floor enamel. Color to be selected by the Contracting Officer from samples provided by the Contractor.

4.10.11 Kitchen in Dining Facility shall be covered with terrazzo flooring. Walls in kitchen shall be ceramic tile up to 2m above finished floor. Floor in Dining area shall be painted concrete.

4.11 SPECIALTIES

4.11.1 Mirrors

0.6m x 0.9m, 6mm plate glass, shall be mounted above all lavatories. Mount bottom of mirrors 1.1m above finished floor.

4.11.2 Toilet Paper Holders

Toilet paper holders, stainless steel, shall be installed approximately 20 cm above floor in Eastern Toilets.

4.11.3 Shower Curtain Rods & Shower Curtain

Shower curtain rods, stainless steel, heavy duty, 18 gauge shall be mounted between the screen walls of each shower stall. Mount rod at 2.0m above finished floor. Provide a shower curtain with support rings for each shower stall.

4.11.4 Grab Bars

Stainless steel grab bars, heavy duty, 18 gauge, two each 900mm and 1050mm long, 40mm dia. shall be mounted behind and beside all eastern toilets, and bathtubs as occur.

4.11.5 Paper Towel Dispensers

Paper towel dispensers, 0.683 mm Type 304 stainless steel, surface mounted. Furnish tumbler key lock locking mechanism.

4.11.6 Light Duty Metal Shelf

Provide a 600mm long, light duty stainless steel shelf and brackets over each lavatory.

4.11.5 Cold Storage Rooms

4.11.5.1 Contractor shall provide the Contracting Officer shop drawings for approval of appropriately sized walk-in refrigerators and freezer to include proposed manufacturer, construction details, manufacturer's instructions, evacuation and charging procedures, operation and maintenance date, start-up and initial operational tests.

4.11.5.2 Walk-in coolers shall be panel type modular construction. Doors shall be swing type. Refrigeration equipment shall be remote located on the exterior of the building. Provide a temperature/ alarm system. Provide interior lighting with exterior switch. Floors of cool rooms shall be insulated panelized construction from the manufacturer of the cool rooms. The concrete floor will not be depressed.

4.11.5.3 Refrigeration piping shall be annealed or hard drawn seamless copper tubing in conformance with ASTM B280. Refrigeration systems shall be remote type.

4.11.5.4 Electrical characteristics shall match local power 400v/3ph/50Hz and 220v/1ph/50Hz.

4.11.5.5 Preservation and packing shall be commercial grade.

4.11.5.6 Provide a recording thermometer.

4.11.5.7 Provide temperature alarm with connector to remote temperature alarm.

4.11.5.8 Provide outdoor condensing unit cover and security fence or wall to protect outside units. Provide condensing unit outdoor controls for operation down to -18 degrees C ambient temperature.

4.11.5.9 Refrigeration Equipment

Refrigeration equipment shall be designed for remote installation. Design units for 16 to 18 hour operation at the indicated interior temperature in -18 degree C ambient temperature. Capacities, air delivery, and dimensions shall be as indicated. Remote condensing units shall be factory fabricated and rated in accordance with UL303 and ARI 365. Provide with motor, air cooled condenser, receiver, compressors, mounted on a common base. Compressors shall be hermetic type. Evaporators shall be factory fabricated and rated in accordance with UL 412 and ARI 420. Forced convection, unit cooler type, made to suspend from the ceiling panels, with forced air discharged parallel to the ceiling. Provide with air circulating motor, multi-fin tube type coil and grille assembled within a protective

housing. Air circulation motors shall be lifetime sealed, and the entire unit-cooler assembly shall be accessible for cleaning. Provide a drip pan and drain connection. When the cold storage room is used for freezing, provide an automatic electric heat defrosting system. Provide a timer type defrost controllers.

4.11.5.9.1 Provide condensate drain lines and drains below freezer floors with electric heating cable, thermostatically controlled to maintain 10 degrees C at zero flow rate. Cable shall be sized in accordance with manufacturer's recommendations.

4.11.5.9.2 Submit a copy of installation instructions to the Contracting Officer covering both assembly and installation of the refrigeration equipment prior to start of work. Start up and initially operate the systems upon completion of the installation of the equipment and refrigerant piping. Adjust the safety and automatic controls to place them in operating sequence. Record manufacturer's recommended readings hourly. Operational test shall cover a period of not less than 24 hours. Upon completion of Operational test the systems shall be performance tested. Test duration shall not be less than 8 hours. Test shall include the following information to be in the report with conclusions regarding the adequacy of the systems:

Time, dates and duration of tests:

- Inside dry-bulb and wet-bulb temperatures maintained in each room during the tests employing recording instruments calibrated before the tests.
- Outside dry-bulb and wet-bulb temperatures obtained from recording instruments calibrated and checked hourly with a sling psychrometer.
- Evaporator and condenser entering and leaving temperatures taken hourly with the compressors in operation.
- The make, model, and capacity of each evaporator and condensing unit.
- Voltmeter and ammeter readings for condensing units and evaporators.

4.11.5.9.3 Provide chart showing the layout of the refrigeration systems, including piping, valves, wiring, and control mechanisms. Submit printed instructions covering the maintenance and operation of refrigeration equipment. Tag shutoff valves in accordance with the instructions. Provide any special tools necessary for repair and maintenance of the systems.

4.11.5.9.4 Remove any packing material. Wash and clean floors, walls, ceilings and equipment inside of cool rooms. Wash and clean exposed surfaces on outside.

4.11.5.9.5 Upon completion of the work and at a time designated by the Contracting Officer, provide instruction to designated personnel in the operation and maintenance of each refrigeration system. The period of instruction shall not be less than one 8-hour day.

4.12 STANDARDS

The Contractor should use the following American standards to provide sound structural design if local standards are not available, relevant, or applicable. The Contractor shall follow American Concrete Institute Standards for design and installation of all concrete structures.

Concrete	280.0 kg./sq.cm cylinder strength @ 28 days (ASTM-. C 31M)
Steel Reinforcement	4218.0 kg./sq.cm(Fy= 60.0 ksi),yield strength.
Welded Wire Fabric	ASTM A185
Anchor Bolts	ASTM A307 using A36 steel.
Concrete Masonry Units	ASTM C90, Type I (normal wt, moisture Cntrl).
Mortar	ASTM C270, Type S (Ultimate compressive strength of 130.0 kg/sq. cm.)
Proportion	1 part cement, 0-1/2 part lime and 4-1/2 parts aggregate

Grout	ASTM C476 (Slump between 200 mm to 250 and Compressive Strength 14 MPa (2000 psi) at 28 days.
Joint Reinforcement	Standard 9 gage minimum, Ladder Type
Structural Steel	ASTM A36: 2530.0 kg./sq.cm (Fy = 36,000psi)
Welding	AWS (American Welding Society) D1.1-2002.

5. STRUCTURAL

5.1 GENERAL

The project consists of various structures. The new buildings shall be provided with a reinforced concrete slab foundation that is properly placed on suitable compacted ground area and shall be in accordance with the recommendations from the geotechnical investigation. The reinforced concrete foundation shall be designed by the Contractor.

5.2 DESIGN

Design shall be performed and design documents signed by a registered professional architect and/or engineer. Calculations shall be in SI (metric) units of measurements. All components of the building shall be designed and constructed to support safely all loads without exceeding the allowable stress for the materials of construction in the structural members and connections.

5.3 DEAD AND LIVE LOADS

Dead loads consist of the weight of all materials of construction incorporated in the buildings. Live loads used for design shall be in accordance with the American Society of Civil Engineers, ASCE STANDARD, and Minimum Design Loads for Buildings and Other Structures, ASCE 7, edition as referenced herein.

5.4 WIND LOADS

Wind loads shall be calculated in accordance with ASCE 7 using a "3-second gust" wind speed of 125 km/hr. All facilities shall be classified as a minimum of Category II in accordance with Table 1-1 in ASCE 7, referenced herein.

5.5 SEISMIC

The building and all parts thereof shall be designed for the seismic requirements as defined by the International Building Code referenced herein. Site-specific data: Spectral ordinates SS=1.65g and S1=0.75g. Soil profile, Site Class D.

5.6 STRUCTURAL CONCRETE

Concrete structural elements shall be designed and constructed in accordance with the provisions of the American Concrete Institute, Building Code Requirements for Structural Concrete, ACI 318, latest edition. A minimum cylinder compressive strength of 4000 psi (28 mPa) shall be used for design and construction of all concrete. Reinforcing steel shall be deformed bars conforming to American Society for Testing and Materials (ASTM) publication ASTM A 615, Deformed and Plain Billet-Steel Bars for Concrete Reinforcement. Concrete at or below grade shall have maximum water-cement ration of 0.40. No concrete shall be placed when the ambient air temperature exceeds 32 degrees C (90 degrees F) unless an appropriate chemical retardant is used. In all cases when concrete is placed at 32 degrees C (90 degrees F) or hotter it shall be covered and kept continuously wet for a minimum of 48 hours. Concrete members at or below grade shall have a minimum concrete cover over reinforcement of 3" (75 millimeters).

5.7 MASONRY

Masonry shall be designed and constructed in accordance with the provisions of Building Code Requirements for Masonry Structures, ACI 530/ASCE 5/TMS 402, latest editions. Mortar shall be Type S and conform to ASTM C 270, latest edition. Masonry shall not be used below grade, unless for fully reinforced and grouted foundation stem walls.

5.8 STRUCTURAL STEEL

Structural steel shall be designed and constructed in accordance with the provisions of American Institute of Steel Construction (AISC), Specifications for Structural Steel Buildings, 9th Edition. Design of cold-formed steel structural members shall be in accordance with the provisions of American Iron and Steel Institute (AISI), Specifications for Design of Cold-Formed Steel Structural Members.

5.9 METAL DECK

Deck units shall conform to SDI Pub. No. 29. Panels of maximum possible lengths shall be used to minimize end laps. Deck units shall be fabricated in lengths to span three or more supports with flush, telescoped or nested 50 mm (2 inch) laps at ends, and interlocking, or nested side laps. Metal deck units shall be fabricated of steel thickness required by the design and shall be galvanized.

5.10 OPEN WEB STEEL JOIST

Open web steel joists shall conform to SJI Specifications and Tables. Joists shall be designed to support the loads given in the standard load tables of SJI Specifications and Tables.

5.11 FOUNDATIONS

Foundations shall be in accordance with the Geotechnical requirements of this RFP.

7. MECHANICAL

7.1 GENERAL

Heating and cooling shall be provided by the use of multi-speed ceiling fans and wood heaters in all buildings, including the guard shacks/towers, supplemented with electric space heaters where space does not permit installation of wood heaters, such as small guard shacks. Wood stoves shall be installed in accordance with local standards, complete with exhaust stacks to ventilate smoke to the outside environment.

Split Pack Air Conditioning, in addition to ceiling fans, should be provided for the Communications Rooms.

7.2 SPECIALIST SUB-CONTRACTORS QUALIFICATIONS

The heating/ventilation and air-conditioning works shall be executed by an air-conditioning specialist sub-contractor experienced in the design and construction of these types of systems.

7.3 CODES, STANDARDS AND REGULATIONS

The equipment, materials and works covered under the heating, ventilation and air-conditioning services shall conform to the referenced standards, codes and regulations where applicable except where otherwise mentioned under each particular clause.

7.4 DESIGN CONDITIONS

Provide computer generated heating and cooling load analysis using the ASHRAE Fundamentals methodology for facilities as required. Based on the location of the project, the designer shall select outside design conditions from standard climatological data sources. The indoor design conditions are provided below

7.4.1 Outside Design Conditions

Latitude – To be determined from project location in Section 01010, Statement of Work.

Longitude – To be determined from project location in Section 01010, Statement of Work

Elevation – To be determined from project location in Section 01010, Statement of Work

Summer

Dry Bulb Temperature: determined from climatological data

Wet Bulb Temperature: To be determined from climatological data.

Winter

Dry Bulb: to be determined from climatological data.

7.4.2 Indoor Design Condition

Summer – 25.6 deg C & 50% RH

Winter – 20 deg C

7.4.3 Noise Level

Noise levels inside occupied spaces generated by HVAC systems shall not exceed NC 35.

7.4.4 Heating, Ventilation and Air Conditioning Requirements

Heating, ventilation, and air-conditioning equipment shall be proposed by the contractor and approved by the U.S. Government to meet heating and cooling requirements. The facility shall be designed using engineering techniques to encourage natural ventilation during the summer. Where building design limits adequate airflow the designer shall provide mechanical ventilation methods such as exhaust/ventilation fans to insure proper air changes. The air change rate shall be calculated using ASHRAE Fundamental methodology. The HVAC requirements are shown in the following table:

Heating Ventilation and Air Conditioning Requirements			
Facility Type	Cooling	Heating	Venitlation
Administration Building	Communication Room Only		Ceiling Fans
Headquarters Buling	Split Pack Air Conditioning and Heat		
Officer's Barracks	Not Required	Wood Stoves	Ceiling Fans
Male Enlisted Barracks	Not Required	Wood Stoves	Ceiling Fans
Female Barracks	Not Required	Wood Stoves	Ceiling Fans
Clinic	Split Pack Air Conditioning and Heat		Ceiling Fans
Dining Facility	Not Required	Elec. Unit Heater	Ceiling Fans
Toilet/Shower/Latrine	Not Required	Elec. Unit Heater	Not Required
Logistics Supply Point	Not Required	Elec Unit heaters	Not Required
Fuel Point	Not Required	Not Required	Not Required
POL Building	Not Required	Not Required	Ceiling Fans
Guard Tower	Not Required	Wood Stove	Ceiling Fans
Guard House	Not Required	Wood Stove	Not Required
Gate House	Not Required	Wood Stove	Not Required
Munitions Storage	Not Required	Not Required	Not Required

7.5. Air Conditioning Equipment

Split System (Ductless) Heat Pump

Unit shall be a split type, factory made assembly, consisting of an indoor section and an outdoor section, designed to work together to provide year round heating and cooling, air-circulating, ventilating, air-cleaning, and dehumidifying functions. The separate sections shall be standard commercial products of the same manufacturer, and shall have ratings based on their being used as matched assemblies.

Minimum Coefficient of Performance (COP) shall be 2.9. Minimum Seasonal Energy Efficiency Ratio (SEER) shall be 10. Refrigerant shall be non-CFC.

Indoor Section

Indoor section shall be a factory assembled unit consisting of indoor coil, centrifugal blower, motor, motor controls, filters, electric resistance heaters, enclosure, and condensate pan, with controls, relief devices, piping, wiring, controls and accessories required for operation. Outlet grille shall be constructed to permit adjustable directional air flow. Unit shall be wall mounted console type construction. The sound level rating shall be less than 45 decibels (dB).

Outdoor Section

Outdoor section shall be a factory assembled unit consisting of outdoor coil, propeller type fans arranged for horizontal discharge, refrigerant circuit with filter-dryer, and hermetically sealed compressor with crankcase heater, internal overload protection and pressure relief valve, all contained in a weather resistant outer casing. Defrost controls, and necessary tubing, piping, controls, control circuits, and required accessories shall be provided. System shall be factory pre-charged with oil and refrigerant. Air inlet and discharge grilles with bird screens shall be provided. The sound level rating shall be less than 60 dB. The unit shall be mounted on a fabricated metal stand a minimum of 300mm above the ground.

Electrical Requirements

Each section shall be equipped with a main power panel and shall include complete branch circuit protection for every electrical component. Main power panel shall completely protect the unit from primary single phasing and over current. Fuses and protective devices shall be provided by the manufacturer and installed at the factory. All components of the main power panel and all control devices shall be UL listed. Wiring shall be in accordance with UL and NFPA 70 requirements. Equipment shall operate on 230 volt, single phase, 50 hertz electrical service.

Controls

A switch with fan/off/cool positions, shall be mounted in the unit or with the remote thermostat. Thermostat shall be remotely mounted where shown on the drawing.

Building wall penetrations shall be carefully made so as not to deteriorate the structural integrity of the wall system. The Contractor shall consult with the building manufacturer, if possible, to determine the best way to penetrate the wall. If the building manufacturer is not available, a structural engineer shall be consulted. In either case, the recommendations of the engineer shall be strictly adhered to.

Submittals

Cooling and heating load calculations

Equipment and Performance Data

Manufacturer's catalog data shall be submitted for the following items:

Air-Conditioning Systems, Compressor, Cooling Coil, Fans, Controls, Casing, Filters, Condenser, Vibration Isolation, Operation and Maintenance Manuals

Routing and size of refrigerant piping

7.6 VENTILATION AND EXHAUST SYSTEMS

7.6.1 All fans shall be used for building ventilation and pressurization with capacities to be selected for minimum noise level generated. Unit mounted fans either used for supply or exhaust shall be centrifugal forward curved, backward inclined, or airfoil fans with non-overloading characteristics of high efficiency and quiet running design. The fans shall be of the heavy-duty type with durable construction and proved performance in a desert environment. Each exhaust fan shall be provided with shut-off dampers which close automatically when the fan is not running. Also, each fan shall be complete with vibration isolator, external lubricators, and all accessories and sound attenuators as necessary.

7.6.2 Submittals

The Contractor shall submit the following for the equipment to be provided under this section of the specification: manufacturer's data including performance characteristics at design conditions; catalog cuts showing dimensions, performance data, electrical requirements, compliance with standards as stated in paragraph CODES, STANDARDS AND REGULATIONS; drawings indicating location and installation details.

7.7 ELECTRIC RESISTANCE HEATERS

7.7.1 Unit Heater. Provide a self-contained electric heating unit, suspended from ceiling or structure, with fan and heating elements. Provide control-circuit terminals and single source of power supply with disconnect. Heating wire element shall be nickel chromium. Include limit controls for overheat protection of heaters. Provide tamper resistant integral thermostat.

7.7.2 Cabinet Heater. Provide a self-contained electric heating unit, recessed mounted in wall or structure, with fan and heating elements. Provide control-circuit terminals and single source of power supply with disconnect. Heating wire element shall be nickel chromium. Include limit controls for overheat protection of heaters. Provide tamper resistant integral thermostat.

7.7.3 Submittals. The Contractor shall submit the following for the equipment to be provided under this section of the specification: manufacturer's data including performance characteristics at design conditions; catalog cuts showing dimensions, performance data, electrical requirements, compliance with standards as stated in paragraph

CODES, STANDARDS AND REGULATIONS; drawings indicating location and installation details.

7.8. CEILING FANS

7.8.1 Ceiling Fan

Provide 1320mm blade ceiling fans at one per 40 square meters of floor space. Fans shall have reversible motors. Center or distribute evenly in room. Coordinate placement with the lighting plan to prevent conflict or casting shadows. Fan mount shall be flush, standard, or angle mount depending on ceiling height. Fan shall be mounted such that the fan blade is approximately 2.44 meters above the finished floor. The fan shall be provided with out light kit. The finish shall be factory painted white. The controls shall be from either a single pole switch or from two 3 way switches to provide on/off operation. The electrical supply shall be 230volts, single phase, and 50 hertz. Install per manufacturers' instructions.

7.8.2 Submittals.

The Contractor shall submit the following for the equipment to be provided under this section of the specification: manufacturer's data including performance characteristics at design conditions; catalog cuts showing dimensions, performance data, electrical requirements, compliance with standards as stated in paragraph CODES, STANDARDS AND REGULATIONS; drawings indicating location and installation details.

7.9 WOOD STOVE SPACE HEATING

7.9.1 Provide Cast Iron stoves, minimum cast iron wall thickness shall be 5mm. Install with adequate clearances per manufactures installation guide. Route the chimney runs inside the building envelope (inside the heated space) so air and flue gases stay at least as warm as the air in the building until they are expelled outside. The chimney shall penetrate the highest part of the building envelope so the chimney functions better. The chimney shall be tall enough and its top is clear of obstacles to wind flow so it can produce stable draft and it has a chimney (rain) cap because without one any chimney is vulnerable to adverse wind pressures. The chimney flue shall be insulated and be the correct size for the appliance so flue gases are kept warm and flow quickly through the system. The flue pipe, if used, shall run straight up from the appliance to the chimney and the chimney has no offsets because each change in direction presents resistance to flow. The appliance and venting system shall be reasonably well-sealed to prevent leaks that introduce cool air and make the system more vulnerable to adverse pressures. The stove shall be certified for low smoke emissions or have equivalent characteristics so it is unlikely to smolder. The system shall be installed in a building that has a balanced ventilation system. There shall be no exhaust fan in the stove exhaust.

7.9.2 Submittals.

The Contractor shall submit the following for the equipment to be provided under this section of the specification: manufacturer's data including performance characteristics at design conditions; catalog cuts showing dimensions, performance data; drawings indicating location and installation details.

7.10 Wood Stove Cooking

Cooking area shall be provided canopy type exhaust only kitchen hoods and associated exhaust fans. These exhaust hoods shall include baffle type aluminum filters to trap grease/oil. The exhaust fan sizing calculations should recognize the use of wood burning stoves in the kitchen, and that there will be excessive smoke loading due to the use of these type of stoves for cooking. Sizing should accommodate all wood burning stoves running simultaneously. Additionally, the placement of the exhaust hood should allow enough clearance for an average sized male to stand on top of the stove platform unobstructed, for standing on the stove is common local cooking practice. The higher than average placement of the hood will require the extension of the lip of the hood out further than normal, in order to catch the majority of the smoke and adequately vent the area.

Make-up air for kitchen hood exhaust shall be pulled in from roof mounted louvered penthouse filter air intake and from adjoining Kitchen/Dining areas.

7.11 TEST ON COMPLETION

7.8.1 After completion of the work, the Contractor shall demonstrate to the Contracting Officer that the installation is adjusted and regulated correctly to fulfill the function for which it has been designed. The Contractor shall test, adjust, balance and regulate the section or sections of concern as necessary until the required conditions are obtained. Include tests for all interlocks, safety cutouts and other protective device to ensure correct functioning. All such tests shall be carried out and full records of the values obtained shall be prepared along with the final settings and submitted to the Contracting Officer in writing.

7.8.2 The following tests and readings shall be made by the Contractor in the presence of the Contracting Officer and all results shall be recorded and submitted in a tabulated form.

a. Room Inside Conditions:

1. Inside room DB & WB temperatures
2. Air flow supply, return and/or exhaust

b. Air Handling Equipment: Air quantities shall be obtained by anemometer readings and all necessary adjustments shall be made to obtain the specified quantities of air indicated at each inlet and outlet. Following readings shall be made:

1. Supply, return and outside air CMH (CFM) supplied by each air conditioning system.
2. Total CMH (CFM) exhausted by each exhaust fan
3. Motor speed, fan speed and input ampere reading for each fan
4. Supply, return and outside air temperature for each air-conditioning system.

c. Electric Motors:

For each motor: (1) Speed in RPM

(2) Amperes for each phase

(3) Power input in KW

8. PLUMBING

8.1 SYSTEM REQUIREMENTS

Domestic water and waste systems shall be provided to each area with fixtures requiring water and/or waste connections such as toilets, etc. The entire water system shall include cold water to each fixture as well as to a water heater. Hot water shall be distributed to all lavatories, sinks, showers, etc. normally requiring hot water. Design of the water distribution and waste systems shall be in complete accordance with the requirements of the National Standard Plumbing Code (NAPHCC-01, latest edition). The Contractor shall design, furnish, install and test a domestic water supply system for each showers/latrines. Mechanical equipment shall be housed inside an insulated enclosure designed for year around operation and suitably protected from weather elements. Contractor shall design and install a domestic water tank system that can be easily converted to a permanent system in the future.

8.2 PIPING MATERIALS

Domestic water shall be distributed by means of PVC (cold water only), CPVC (cold or hot water) or copper for the pressure to be utilized. PVC and CPVC shall not be used in areas where it will be exposed to outdoor sun.

8.3 FIXTURES

All plumbing fixtures shall be provided with p-traps and shall be vented to the roof per International Plumbing Code, latest edition.

8.3.1 Eastern Style Water Closet with Flush Tank

Provide acid resisting fired porcelain enameled cast iron water closet complete with rotating No-Hub 'P' trap and No-Hub coupling to meet piping requirements. Eastern Style water closet shall be furnished with integral non-skid foot pads and bowl wash down non-splashing flushing rim. The water closet shall be completely self supporting

requiring no external mounting hardware and shall be flush with floor. The Eastern Style water closet shall incorporate waterproofing membrane flashing flange. Provide wall mounted faucet. Toilets shall be oriented north and south. Toilets shall not face east or west.

8.3.2 Urinals

Not required.

8.3.3 Lavatories

All sinks shall be trough type constructed of block and concrete with ceramic tile exterior and lining capable of withstanding abuse. Faucets shall be chrome plated brass single lever mixing type.

8.3.4 Water Heater

Electric type water heaters shall conform to UL 174 with dual heating elements. Each element shall be 4.5 KW. The elements shall be wired so that only one element can operate at a time. Each water heater shall have controls with an adjustable range that includes 32 to 71 degrees C

A factory pre-charged expansion tank shall be installed on the cold water supply to each water heater. Expansion tanks shall be specifically designed for use on potable water systems and shall be rated for 93 degrees C 200 degrees F water temperature and 1034 kPa 150 psi working pressure. Electrical wiring shall be installed per the NEC and the manufacturer's instructions. Piping and fittings for hot, cold, drain, and pressure temp connections shall be installed per the manufacturer's recommendations.

8.3.5 Plastic Shower Stalls

Provide one piece or four piece white solid acrylic pressure molded fiberglass reinforced plastic shower stalls. Shower stalls shall be scratch resistant, waterproof, and reinforced. Provide recessed type shower stalls approximately 914 mm wide, 914 mm front to rear, 1829 mm high, and 125 mm high curb with shower stall bottom or feet firmly supported by a smooth level floor. Provide PVC shower floor drains and stainless steel strainers. Install shower stall in accordance with the manufacturer's written instructions. Provide smooth 100 percent silicone rubber white bathtub calk between the top, sides, and bottom of shower stalls and bathroom walls and floors.

8.3.6 Scullery Sink (Kitchen Area)

Provide 14 gauge, type 304, (18-8) stainless steel, sink with drain board. Compartments shall be large enough to wash pots 1 meter in diameter. Sink shall be supported on four stainless steel legs. Sink shall have pre-drilled in backsplash at manufacturer for commercial faucet. Commercial faucet shall be solid brass construction, chrome finish, wall mount 203mm center arc tube.

8.3.7 Floor Drain and Shower Drain

Floor drains and shower drains shall consist of a galvanized body, integral seepage pan, and adjustable perforated or slotted chromium-plated bronze, nickel-bronze, or nickel-brass strainer, consisting of grate and threaded collar. Floor drains shall be cast iron except where metallic waterproofing membrane is installed.

8.3.8 Insulation

All domestic water pipe and fittings that are exposed and not inside an insulated wall shall be insulated, In addition all water pipe that is exposed shall also be covered with metal jacketing.

8.4 Vehicle Fuel Point

Provide fuel storage and dispensing facilities. Provide separate storage and dispensing facilities for each grade or type of fuel to be dispensed. Provide underground horizontal fuel storage tanks. Use a commercially available dispenser with a self-contained electric motor and pumping unit or a remote pumping type where the pump and motor are located in the storage tank. Dispenser and nozzle shall be securable by means of standard padlock. Card and key lock access is not required. Surround fueling islands with a concrete slab graded at a minimum of 1 percent slope away from island and fuel storage tanks. Shelter for staff is not required. Design must comply with NFPA 30, NFPA 30A, API RP 1615, and UFC 3-460-01, Design: Petroleum Fuel Facilities.

8.5 Generator Fuel Storage

The work shall include the design, fabrication and installation of the entire fuel storage and dispensing type system. Tanks shall be skid mounted. Tanks of this type that have a capacity above 2640 L will be provided with either a dike or a spill containment system. The dike or spill containment system should have enough capacity for the entire contents of the tank plus 10 percent. Provide a molded neoprene isolation pad to isolate an aboveground tank from the concrete pad underneath. Steel tank supports specifically are prone to encounter premature rusting due to constant exposure to moisture and their incompatibility with concrete. Tank shall be designed and manufactured for horizontal installation. Tank shall be mounted on the tank manufacturer's standard support skid. Skid shall span the entire length of the tank and shall separate the tank from the reinforced concrete slab by a minimum of 200 mm. Indicate on the drawings the number and size of each tank manway required. Tanks of 3,780 to 45,430 L to capacity will be provided with 760 mm diameter manways. Tanks larger than 45,430 L will be provided with 915 mm diameter manways. Tanks 3,780 L and larger will be provided with a minimum of 1 tank manway to allow for internal tank access. Piping will not penetrate through access manways. Tank shall be provided with a combination cleanout and gauge connection. Vent pipe sizing shall be not less than 32 mm nominal inside diameter. Vent shall be the rupture disc type calibrated to burst at 13.8 kPa pressure, and operate at 80 percent of burst setting. Tank shall be provided with an overfill alarm system. Tank shall be provided with 2 stick gauges graduated in m and mm. Stick gauge shall be of wood and treated after graduating to prevent swelling or damage from the fuel being stored. Each storage tank shall be provided with an automatic analog reading gauge which is directly mounted to a tank's manway cover. Provide an in-line centrifugal pump or a submersible pump. Provide cathodic protection for metal components. Storage tanks shall be handled with extreme care to prevent damage during placement and shall be installed in accordance with the manufacturer's installation instructions. Piping shall be inspected, tested, and approved before burying, covering, or concealing. Piping shall be installed straight and true to bear evenly on supports. Piping shall be free of traps, shall not be embedded in concrete pavement, and shall drain toward the corresponding storage tank. Any pipe, fittings, or appurtenances found defective after installation shall be replaced. Belowground nonmetallic pipe shall be installed in accordance with pipe manufacturer's instructions. Belowground piping shall be laid with a minimum pitch of 25 mm per 6 m. A tightness test shall be performed on each aboveground storage tank. The tests shall be performed prior to making piping connections. Tests shall be capable of detecting a 0.1 mL/s leak rate from any portion of the tank while accounting for effects of thermal expansion or contraction. Each storage tank shall be pressurized with air to 35 kPa and monitored for a drop in pressure over a 2-hour period during which there shall be no drop in pressure in the tank greater than that allowed for pressure variations due to thermal effects. Following the tank tightness test, each storage tank shall be leak tested in accordance with the manufacturer's written test procedure if the manufacturer's test procedure is different from the tightness tests already performed. Each storage tank shall be filled with the proper fuel.

Submittals:

Manufacturer's standard catalog data

Installation Manual

Operation and Maintenance Manuals

Tests Results:

Six copies of each test containing the information described below in bound letter-size booklets. Individual reports shall be provided for the storage tank tests, the piping tests, the system performance tests, the high level alarm test, and the system leak tests. Drawings shall be folded blue lines, with the title block visible.

a. The date the tests were performed.

- b. A list of equipment used, with calibration certifications.
- c. A copy of measurements taken.
- d. The parameters to be verified.
- e. The condition specified for the parameter.
- f. The inspection results, signed, dated, and certified by the installer. The certification shall state that required procedures were accomplished, that the procedures were conducted in compliance with the plans and specifications.
- g. A description of adjustments performed.

8.6 Submittals.

The Contractor shall submit the following for the equipment to be provided under this section of the specification: manufacturer's data including performance characteristics at design conditions; catalog cuts showing dimensions, performance data, electrical requirements, and drawings indicating location and installation details.

9. FIRE PROTECTION

9.1 GENERAL

Facility construction and fire protection systems shall be installed in accordance with the publications listed herein and the publications referenced therein. Where a conflict occurs among various criteria, the more stringent requirement shall take precedence.

9.2 BUILDING CONSTRUCTION

Building construction shall conform to fire resistance requirements, allowable floor area, building height limitations and building separation distance requirements of the building code.

9.3 LIFE SAFETY

Facilities features will be provided in accordance with NFPA 101, among other references, to assure protection of occupants from fire or similar emergencies.

9.4 FIRE PROTECTION EQUIPMENT

Per user, a sprinkler system is not required.

9.5 FIRE ALARM AND DETECTION

9.5.1. General. The Contractor shall provide install, connect and test a fire, smoke, and carbon monoxide detection and alarm system. The system shall include, but not be limited to, detection devices, manual pull stations, annunciators, conduit, and wiring. The system shall comply with requirements of NFPA Standard No. 72. The detection and alarm devices shall have battery backup power. Connection to a remote monitoring station is not required.

9.5.2. Submittals

Shop Drawings. Provide sufficient information to determine compliance with drawings and specifications. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts. Show annunciator layout, configurations, and terminations.

Manuals. Provide complete operating and maintenance manuals listing the manufacturer's names, including technical data sheets. Provide a clear and concise description of operation that gives the information required to properly operate the equipment and system.

9.5.3. Warranty. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be the responsibility of the Contractor.

9.6 WATER SUPPLY FOR FIRE PROTECTION

Water supply for fire protection is not required.

9.7 PORTABLE FIRE EXTINGUISHERS

Portable fire extinguishers shall be provided inside all facilities and at exterior locations as required in accordance with NFPA 10. Generally, extinguishers will be of the multi-purpose dry chemical type except for occupancies requiring a special type extinguisher (e.g., carbon dioxide portable fire extinguishers for electrical rooms).

10. ELECTRICAL

10.1 GENERAL

Contractor shall design and construct all electrical systems. This includes design, construction, all necessary labor, equipment, and material for a fully functional system. Secondary electrical distribution system shall be 220/380 volt, 3-phase, 4 wire, 50 hertz. Design of the electrical system shall include, but is not limited to (a) interior secondary power distribution system, (b) lighting and power branch circuit and devices, (c) fire detection and alarm system, (d) generation, and (e) power distribution. All systems shall be designed for the ultimate demand loads, plus 20% spare capacity.

10.2 Design Criteria

10.2.1 Applicable Standards

- a. Design shall be in the required units as stipulated herein.
- b. Conflicts between criteria and/or local standards shall be brought to the attention of the Contracting Officer for resolution. In such instances, all available information shall be furnished to the Contracting Officer for approval.
- c. All electrical systems and equipment shall be installed in accordance with NFPA 70, UFC 3-540-04N (Diesel Electric Generating Plants), UFC 3-550-03FA (Design: Electrical Power Supply and Distribution), UFC 3-520-01, Interior Electrical Systems, 10 June 2002 and Army TM 5-811-01 (Electrical Power Supply and Distribution) requirements..
- d. Acceptance Testing: Contractor shall develop and submit for approval complete acceptance test procedures on all systems provided. As a minimum the testing procedures shall comply with the requirements of NFPA 70 (NEC) and International Electrical Testing Association Inc. (NETA).
- e. Any other applicable references listed herein.

10.3 Material:

10.3.1 General:

Contractor shall follow the latest edition of the following standards and criteria for the design and installation of electrical systems:

UFC 3-600-01 Design: Fire Protection Engineering for Facilities

National Electrical Safety Code (IEEE C2)

National Fire Protection Association Codes including:

NFPA 70, National Electrical Code, 2005 edition

NFPA 72, National Fire Alarm Code, 2002 edition

NFPA 90A, Air Conditioning and Ventilating Systems, 2002 edition

NFPA 101, Life Safety Code, 2003 edition

NFPA 110, Standard for Emergency and Standby Power Systems 2005

Illuminating Engineering Society of North America Lighting Handbook

UFC 3-550-03FA Design Electrical Power Supply and Distribution 1 March 2005

TM 5-811-3 Electrical Design: Lightning and Static Electricity Protection

TM 5-811-7 Electrical Design: Cathodic Protection

ETL 1110-3-440, Cathodic Protection

ETL 1110-3-474, Cathodic Protection

IEEE standard 519-1992

UFC 3-520-01 Interior Electrical Systems, 10 June 2002

UFC 3-530-01AN Design: Interior and Exterior Lighting and Controls 19 Aug 2005

UFC 3-540-04N Design: Diesel Electric Generating Plants 16 Jan 2004

UFC 3-550-03FA Design: Electrical Power Supply and Distribution Systems 1 Mar 2005

UFC 3-501-03N Electrical Engineering Preliminary Considerations

UL 467 Grounding and Bonding Equipment

Institute of Electrical and Electronics Engineers, IEEE 48

International Electrical Testing Association Inc. (NETA) Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems

EIA ANSI/TIA/EIA-607: (1994) Commercial Building Grounding/Bonding Requirement Standard

ETL 1110-3-412, "Transformer Application Guide", 20 Oct 1989

EIA ANSI/TIA/EIA-607: (1994) Commercial Building Grounding/Bonding Requirement Standard.

ANSI/IEEE Std 81-1983

IEEE Std 81.2-1991

IEEE Std 62™-1995 (R2005)

IEEE 519 - 1992

ANSI/NETA ETT-2000

ANSI/NETA MTS 7.2.2-2001

MIL-HDBK-1012/3

Unless noted otherwise, all material used shall be in compliance with the requirements of UL standards. In the event that UL compliant materials are not available, contractor may then select applicable British Standards (BS), IEC or DIN listed material, but the contractor must prove equivalence and must provide the government with a full copy of the relevant specification(s). Material and equipment installed under this contract shall be for the appropriate application and installed in accordance with manufacturers recommendations.

10.3.2 Standard Product:

All material and equipment shall be a standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least two (2) years prior to bid opening.

10.3.3 Design Conditions: All equipment shall be rated and designed for 50 degrees Celsius (122 degrees Fahrenheit) and minimum elevation of 1800 meters (5900 feet) above sea level.

10.3.4 Restrictions: Aluminum conductors shall not be specified or used. Aluminum windings shall not be permitted on transformers.

Transformers, if required, shall be of the dead-front, pad-mounted type.

10.4 Design Requirements

10.4.1 Electrical Distribution System

Generators shall be provided for on site power. Generators shall be provided in a minimum of two (2) set-configuration to serve the maximum total load plus 20% spare capacity. **Backup generators (capacity above 120% demand load) shall NOT be required for this project.** Generators shall be pad mounted within an enclosure rated for exterior use. An Automatic Synchronizing Transfer Switch shall be provided for automatic transfer of power when switching from one generator to another when the electrical demand load is below 90% of a single generator, and shall automatically start and synchronize the second generator when the first is operating above 90% capacity so as to allow both generators to equally share the demand load. When only one generator is required, transfer between generators shall be fully automated with a programmable time clock. Generators shall be fitted with load banks matched to the load. Generators design shall be governed by the NEC, NESC, UFC 3-550-03FA (Design: Electrical Power Supply and Distribution), UFC 3-540-04N (Diesel Electric Generating Plants), and Army TM 5-811-01 (Electrical Power Supply and Distribution).

The Contractor shall perform a short-circuit current and relay coordination study for the complete generation system. Based on the results of this study he shall determine the proper time, pick-up, and trip ratings for the protective devices. The Contractor shall evaluate the complete system existing and new, for proper protection and coordination. The report shall be submitted to the Contracting Officer for approval.

Generator fuel storage capacity shall be based on usage at total electrical load for a minimum of 30 days at full load for the entire duration. Fuel storage shall either be in aboveground single wall steel tank(s) with containment pit or underground double wall with leak detection. The contractor shall provide and install properly sized service entrance feeder from the generator system to the service entrance equipment located inside of each facility. Service entrance equipment shall include a distribution panel board properly sized to feed each facility. Contractor shall coordinate with the Contracting Officer in locating the main distribution panel board(s) as close as possible to the corresponding ATS.

All panel boards shall be circuit breaker 'bolt-on' type panels. Minimum size circuit breaker shall be rated at no less than 16-amperes. Circuit breakers shall be connected to bus bar(s) within the panel boards. Daisy chain (breaker-to-breaker) connection(s) are not acceptable. Indoor distribution panels shall be flush mounted in finished areas and surface mounted in unfinished areas. All circuit breakers shall be labeled with an identification number corresponding to the panel schedule. A 3-pole circuit breaker shall be a single unit and not made up of 3 single pole circuit breakers connected with a wire or bridged to make a 3-pole breaker. All wiring shall be copper, minimum 4mm² (# 12 AWG) installed in metal conduit. Conductors shall be sized in accordance with NFPA 70. The use of 75 or 90 degree C (minimum) terminals and insulated conductors is required. Use of 75 degree C conductors on circuits with protective device terminals rated for 60 degree C is inappropriate. Wiring shall be recessed in finished areas and surface mounted in unfinished areas.

Flush mounted panels shall be provided with spare empty conduits from panel to unfinished area for future use. All panels shall be provided with a minimum of 20% spare capacity for future load growth. Power receptacles (outlets) shall be duplex type 220 V, 50 hertz and shall be compatible with the required secondary power. Outdoor receptacles shall be weather-proof and GFCI protected. Indoor receptacles near wet or damp locations shall be GFCI protected. Simplex outlets shall not be used unless specifically called for in another section of this RFP.

All splicing and terminations of wires shall be performed in a junction or device boxes. Proper wire nuts/connectors shall be used for splicing wire. No twist-wire connections with electrical tape wrapped around it shall be acceptable. All electrical installation shall be in accordance with NFPA 70 (National Electric Code). For large panels (225 Ampere and above) provide an ammeter, voltmeter and kilowatt-hour meter to monitor energy usage. Selector switch shall be provided for reading all 3 phases. Circuits shall be provided for all mechanical equipment and final connections made. Receptacle locations shall be coordinated with architectural requirements.

Contractor shall provide (design and install) circuits for all mechanical equipment and any other equipment that requires power and make the final connections.

10.4.2 Lighting

Design levels shall be per IES and UFC 3-530-01AN (Design: Interior and Exterior Lighting and Controls), standards as a minimum. For convenience, the following lighting level table is listed. Note: all spaces listed below may not be within the work required within this contract.

Living room/Quarters	35 FC (350 Lux)
Toilets, Showers, Latrines	20 FC (200 Lux)
Mechanical/Electrical rooms	30 FC (300 Lux)
Corridors and Stairways	20 FC (200 Lux)
Offices (private)	50 h/5 v FC (500 h/50 v Lux)
Offices (open)	30 h/5 v FC (300 h/50 v Lux)
Kitchens (commercial)	50 h/3 v FC (500 h/30 v Lux)
Dining Areas	30 h/3 v FC (300 h/30 h Lux)
Conference	30 h/5 v FC (300 h/50 v Lux)
Video Conference	50 h/30 v FC (500 h/300 v Lux)
Armories	30 h/3 v FC (100 h/30 v Lux)
Worship (congregational areas)	10 h/3 v FC (100 h/30 v Lux)
Worship (leader area)	30 h/30 v FC (300 h/300 v Lux)
Egress path	10 Lux
Areas adjacent to egress path	0.5 Lux

FC = footcandle

H = horizontal component

V = vertical component

Indoor lighting for all areas shall consist of fluorescent surface mounted light fixtures. Exterior lighting will be installed as referenced. Moisture resistant/waterproof fluorescent light fixtures shall be provided in high humidity and wet areas such as latrines and showers. Battery powered 'emergency' and 'exit' lights shall be provided within each building, as applicable, for safe egress during a power outage. All light fixtures shall be factory finished, complete and operational, to include but not be limited to, lens, globe, lamp, ballast etc. Industrial type fluorescent light fixtures shall not be used, except in unfinished mechanical or electrical service rooms. Every room shall be provided with a minimum of one light switch, and there shall be a light switch at every door; if there is more than one entrance to a room, two-, three-, four- way switches shall be used, as appropriate. Light fixtures shall be mounted approximately 2.5-meters (8 feet) above finished floor (AFF), minimum. Fixtures may be pendant or ceiling mounted, depending on the ceiling type and height.

10.4.3 Light Fixtures

Lighting fixtures shall be a standard manufacturer's product. Fluorescent surface mounted light fixtures shall be power factor corrected and equipped with high frequency electronic ballast(s). Lamps shall be selected in accordance with UFC 3-530-01AN (Design: Interior and Exterior Lighting and Controls). All light fixtures shall properly operate using standard lamps available locally. Fixtures shall be fully factory wired and designed for appropriate application i.e. appropriate for that location where installed.

10.4.4 Emergency "EXIT" Light Fixtures

Emergency "EXIT" light fixture shall be provided in accordance with NFPA requirements. Fixtures shall be single side and for wall/ceiling mounting. Unit shall illuminate continuously and be provided with self-contained nickel cadmium battery pack, to operate on floated-battery or trickle charge circuit. Fixture shall operate satisfactorily for 90 minutes during a power outage. Unit shall have test/re-set and lamp failure indication buttons. Primary operating voltage shall be 120 volts. Lettering "EXIT" shall be color red and not less than 6 inches (150 mm) in height and on matte white background. Illuminations shall be with LEDs.

10.4.5 Above Mirror Lights

Above mirror lights shall be provided in toilet rooms.

10.4.6 Emergency Lighting

Battery powered emergency lights shall be provided within each building per NFPA for safe egress during power outage. Fixtures shall be provided with self-contained nickel cadmium battery pack to operate on stand-by circuit for 90-minute minimum. Unit shall have test/re-set and lamp failure indication buttons. Primary operating voltage shall be 220 volts.

10.4.7 Light Switches

Light switch shall be single pole. Minimum of one light switch shall be provided in every room. Lighting in large rooms/areas may be controlled from multiple switches. Three-way or Four-way lighting shall be provided in all rooms / areas with multiple entrances.

10.4.8 Receptacles

General-purpose receptacles shall be as required herein. Receptacles shall be placed at 3-meter (10 feet) intervals in general inside buildings. Duplex receptacles shall be placed above each sink, to the side of the mirror. One duplex receptacle may serve two sinks that are side-by-side. Receptacles in wet/damp areas or within 1 meter (~3 feet) of sinks, lavatories, or wash-down areas shall be ground fault circuit interrupter (GFCI) type or Residual Current Disconnect (RCD) type, with the trip setting of 30 milliamperes or less. Total number of duplex receptacles shall be limited to six (6) per 16-ampere circuit breaker.

10.4.9 Conductors

All cable and wire conductors shall be copper. Conductor jacket or insulation shall be color coded to satisfy local utility requirements. Conductors shall be sized in accordance with NFPA 70. The use of 75 or 90 degree C (minimum) terminals and insulated conductors is required. Use of 75 degree C conductors on circuits with protective device terminals rated for 60 degree C is inappropriate. Wire size shall be a minimum of 4mm² (#12 AWG).

10.4.10 Grounding and Bonding

Grounding and bonding shall comply with the requirements of NFPA 70, Army TM 5-811-01, and UFC 3-550-03FA. Generating equipment shall also comply with the requirements of UFC 3-540-04N. Underground connections shall be exothermal welded. All exposed non-current carrying metallic parts of electrical equipment in the electrical system shall be grounded. Insulated grounding conductor (separate from the electrical system neutral conductor) shall be installed in all feeder and branch circuit raceways. Grounding conductor shall be green-colored, unless the local authority requires a different color-coded conductor. Ground rods shall be copper-clad steel. Final measurement of the ground resistance shall be in compliance with the requirements of the local authority but shall not exceed 25 ohms when measured less than 48 hours after rainfall for buildings and distribution system. Ground resistance of Generator ground-grid shall not exceed 5 ohms when measured less than 48 hours after rainfall.

10.4.11 Enclosures

Enclosures for exterior and interior applications shall be NEMA Type 3R (IEC Classification IP54) and NEMA Type 1 (IEC Classification IP10), respectively.

10.4.12 Fire Detection & Alarm System

Omitted

10.4.13 Surge Suppression and Lightning Protection

Transient Voltage Surge Suppression shall be provided utilizing surge arresters to protect sensitive and critical equipment. As a minimum TVSS protection shall be provided at each circuit panel. It is recommended that Metal Oxide Varistors (MOV) technology be used for such application. Panel surge suppression shall be installed per NEC, UFC 3-520-01 (Interior Electrical Systems), and Army TM 5-811-01 (Electrical Power Supply and Distribution).

Lightning protection shall be provided for the primary distribution system using lightning arrestors. Lightning protection shall be installed per NESC, UFC 3-550-03FA (Design: Electrical Power Supply and Distribution), and Army TM 5-811-01 (Electrical Power Supply and Distribution).

10.4.14 Conduit Raceway System

Metal conduit system shall be complete, to include but not limited to, necessary junction and pull-boxes. Smallest conduit size shall be no less than 20mm (0.75 inch) in diameter. All empty conduits shall be furnished with pullwire. System design and installation shall be per NFPA 70 requirements. Exterior conductors shall be installed in PVC conduit at a depth of 48-inches.

10.4.15 Cable Tray Raceway System

Cable trays shall be ladder type and provided with, but not limited to, splices, end plates, dropouts and miscellaneous hardware. System shall be complete with manufacturer's minimum standard radius and shall be free of burrs and sharp edges. Nominal width of cable tray shall be 300mm (12 inch) and rung spaced at 150mm (6 inch). Nominal depth shall be 100mm (4 inch). System design and installation shall be per NFPA 70 requirements.

10.4.16 Identification Nameplates

Major electrical equipment, such as transformers, panel boards, and load centers, etc. shall be provided with permanently installed engraved identification nameplates in English and Dari.

10.4.17 Schedules

All panel boards and load centers shall be provided with a panel schedule. Schedule shall be typed written in English and Dari.

10.4.18 Single Line Diagram

Complete single line diagrams shall be provided for all systems installed. All major items in each system shall be identified and labeled for respective rating. Single line diagrams for each system, installed in a clear plastic frame, shall be provided. Labeling shall be in English and Dari.

10.5 Acceptance Testing

Contractor shall develop and submit for approval complete acceptance test procedures on all systems provided. As a minimum the testing procedures shall comply with the requirements of NFPA 70 (NEC), IEEE 48, and International Electrical Testing Association Inc. (NETA).

10.6 Spare Parts And Consumables:

The Contractor shall provide for all systems, based upon manufacturer's recommendations, a supply of spare parts, equipment and consumables necessary to maintain operations throughout the performance period and conduct preventive maintenance and repair for a 6 month period beyond the contract performance period, to include those items required to perform testing and commissioning. The contractor shall replace any light bulbs that have been used for more than 15% of their expected life at the time of turnover to the government.

The Contractor shall provide all materials, supplies, and expendables required to conduct all testing and commissioning activities. The Contractor shall replace all oil/fuel filters during the testing and acceptance period if required by the manufacturer's recommendations. The Contractor shall assure all new fuel tanks are filled to capacity and oil/coolant levels on new generators, transformers, etc. are filled to the upper operating level at time of turnover to the Government. The cost of fuel, oil, filters, and other consumables up to the time of Government acceptance is the responsibility of the Contractor.

10.7 Safety and Working Clearances

All electrical work shall be designed in accordance with the 2005 National Electrical Code (NEC), National Electrical Safety Code (NESC), and Army EM 385-1-1 (Safety and Health Requirements) as appropriate. Safe working and maintenance clearances around the equipment shall be provided.

--END OF SECTION--

(End of Summary of Changes)